Working Draft Technology Plan 2007-2010

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Preface

Central Premise of Technology Plan

Significant and continuing improvement in student achievement requires:

- **A major paradigm shift creating a new classroom Teaching and Learning Model where;**
  - The teachers' role changes from predominately lecture to that of a facilitator, mentor, and manger of instruction;
  - Students become active participates in a collaboration, project based, small group learning environment;
  - Students acquire critical thinking, problem solving, information analysis, and life long learning skills;
  - Parents and community are engaged; and where
- **The new Teaching and Learning Model is effectively supported by an infusion of ubiquitous classroom technology.**

Preface

The 2007-2010 Technology Plan was developed for and by the Providence School Department (PSD) with the assistance of Innovative Systems Design and Training (d/b/a Educational Systems Planning)*. The Plan is an enhancement and updating of the 2004 Technology Plan Report developed by the CELT Corporation. Educational Systems Planning and the Providence School Department acknowledge that a significant portion of the information and specific material from the CELT document is carried forward into the 2007-2010 Technology Plan. The development of the plan was accomplished, in consultation with, and during the same time period as the Facilities Master Plan developed by DeJong and Associates.

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- *Purpose*

The purpose of the Technology Plan is to:

- ❑ Document the Department's desired current and future technology utilization,
- ❑ Meet E-rate submission requirements,
- ❑ Coordinate with PSD's educational plans and initiatives,
- ❑ Submit to the Rhode Island State Department of Education, and
- ❑ Provide facilities and technology infrastructure guidelines and standards to architects designing new and modernized schools.

- *Process and Approach*

The Technology Plan is the culmination of a three phase development process conducted by Educational Systems Planning with the assistance of the PSD staff.

Phase 1 of the project involved assessment of existing documentation, collaboration with PSD staff and data collection. ESP conducted a series of interviews with Department instructional, administrative staff and held extensive meetings with staff of Office of Information Technology. Data was collected and reviewed concerning the current technology systems, applications, support and staffing resources.

As part of the data collection effort, Educational Systems Planning met with and had lengthy discussions with the following members of the PSD Technology Planning Committee:

- ❑ Brian Baldizer - Special Assistant to the Superintendent
- ❑ Denise Carpenter - Executive Director - Middle Schools

- Dr. Frances Gallo - Deputy Superintendent
- Edward Miley - Director of Leadership Development
- Jeremy Chiappetta - Superintendent's Intern
- John Mickelson - Director of Assessments and Evaluation
- Mark Dunham - Chief Financial Officer
- Stephen Tremblay - Director of Facilities
- Carrie Mauer - Director of Professional Development
- Lisa Vargas-Sinapi - Director of Related Services, Office of Special Populations
- Kyle Davie - Chief Technology Officer

Educational Systems Planning would like to thank the committee for their input into the development of the draft plan.

Phase 2 involved the development of a draft plan document which was submitted to the Providence School Department for review and elaboration.

Phase 3 consisted of the review and finalization process of the document for its final submission.

The overall approach taken in the development of the Technology Plan has been to develop a central premise around the Department's three major goals, which are to:

- Increase student achievement,
- Create capacity to support continuous learning environments, and
- Strengthen parent and community engagement.

The central premise presented in the Technology Plan is somewhat bold but reflects where education must be headed in order to truly improve student achievement. The plan sets forth a series of phased goals and activities that will move the Department toward the following premise in a manner consistent with the Departments ability to absorb the process of change and within budget constraints.

- *Central Premise*

Achieving significant and continuing improvement in student achievement and the ability to function in our changing society will require a major paradigm change in classroom teaching and learning (T&L). To achieve the later will require a significant change in the role and functioning of teachers from a predominately lecture format to one where the teacher is a facilitator and manger of instruction and students are active participates in the process. Students must be actively involved in collaborative, project based, and team learning which will build student critical thinking, problem solving, team participation, information gathering and analysis, and life long learning skills. Effective and seamless implementation and utilization of technology in the learning environment will not just facilitate the accomplishment of the central premise; it may well be a necessity.

Significant and continuing improvement in student achievement requires:

- A major paradigm shift creating a new classroom teaching and learning (T&L) model where;
  - The teachers' role changes from predominately lecture to that of a facilitator, mentor, and manger of instruction;
  - Students become active participates in learner centered, collaborative, project based learning environments;
  - Students acquire critical thinking, problem solving, information analysis, and life long learning skills;
  - Parents and community are engaged; and where
- The new Teaching and Learning Model must be effectively supported by an infusion of ubiquitous classroom technology.

- *Implementation*

All aspects of the Technology Plan are designed to provide the necessary support to allow technology to facilitate the proposed major paradigm shift. The writers of the plan appreciate that this is huge undertaking and will require significant resources currently not available to the department. **Of major significance is the teacher's role changing from predominately lecturer to that of a manager of instructional activities and the necessary expansion of skill sets it will require of many teachers**. The new Teaching and Learning Model which is proposed by the premise will also require a re-focusing of technology equipment and resources from locations outside the classroom to complete integration into classrooms, science labs and other learning areas. It is recognized that the process of change within the Providence School Department is critical to the ultimate accomplishment of the central premise. Only if the change is personally relevant at the level of the individuals spirit will the desired results be attained. The critical issues or inhibitors discussed in Chapter 1 are paramount; and it will be the staff's ability to gravitate towards the new premise that will spell success. Although this is a Technology Plan, technology equipment and school facilities can do no more then facilitate the new T&L model.

The Technology Plan proposes an implementation composed of three components:

- A full scale implementation of the new technology supported T&L model in three demonstration schools; an elementary, middle and high school.
- Continued enhancement of existing technology re-focused toward the classroom in all remaining schools. A new technology supported T&L model demonstration classroom phased into each school to serve as model classroom and professional development center.
- All new and modernized schools are to be designed and staffed for full implementation of the technology supported new T&L model.

- *Facilities*

The Providence School Department is in the planning process of an extensive school building replacement and modernization program that will affect the lives of the students, instructional staff and the community. This extensive school facilities program comes at a time of significant emphasis on changing the way students learn in school environments. This paradigm shift from an industrial learning model to

information learning model and the resulting desired learning environment is discussed in Chapter 1.

The magnitude of the school construction program could focus the attention of the Department on the "bricks & mortar" aspect and miss the opportunity to use this effort as a "window of opportunity" for significant change in the instructional process. New school buildings will have a defining and significant impact on the instructional process in Providence for the next half-century. Consequently, it is important that the use of new instructional technology be appropriately and effectively planned for use in these new facilities. The design of the Department's new and modernized schools can become a significant change agent in this new paradigm shift. **The real challenge is to develop a school design process that will focus on teaching and learning areas for today and tomorrow, and to design each school for its specific student target population, while maintaining department-wide technology implementation standards.**

Consequently, one of the objectives of the Technology Plan is to provide architects hired to design new and renovated schools, with guidelines and standards, which incorporate Providence School Department's desired uses of instructional and administrative technology. To meet this facilities objective, the plan:

- Identifies the impact of learning trends, technology trends, and the desired learning environments on facilities and communications infrastructure design,
- Documents the Department's desired learning environments, and
- Provides facilities design guidelines for technology in new and modernized schools, and defines detailed communications infrastructure standards.

- *Document Organization*

The Technology Plan is separated into five separate chapters addressing the foundations of Technology Planning, the departments' planned utilization of technology, and implementation strategies.

- Chapter 1 describes the Department's direction for the use of technology in the schools through the creation of a technology vision, mission statement and central premise which defines the paradigm shift necessary to significant improvements in achievement.
- Chapter 2 addresses and describes the specific goals for technology utilization and implementation.
- Chapter 3 provides guidelines of facilities requirements to support technology.
- Chapter 4 contains more specific information related to the design of specific technology systems that will be integrated into new and renovated facilities. This chapter provides generic descriptions of the required systems and equipment.
- Chapter 5 provides budget and implementation planning materials.

- *Acknowledgements*

ESP would like to acknowledge the assistance of the technology committee, Superintendent's staff, especially Dr. Fran Gallo, Deputy Superintendent and Mr. Kyle Davie Chief Technology Officer and his staff.

Chapter 1
Technology Planning Foundations

Central Premise of Technology Plan

Significant and continuing improvement in student achievement requires:

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- **The new Teaching and Learning Model is effectively supported by an infusion of ubiquitous classroom technology.**

This Chapter contributes to the Central Premise by:

- defining the District's technology mission statement and vision,
- defining the implications for the learning environment, and
- presenting implementation critical issues.

Chapter 1 Technology Planning Foundations

1.1 Changing Educational Environment

Society is completing an evolutionary shift from the Industrial Age to the Informational Age. Accordingly, educational institutions must realign their practices, policies and procedures with *Digital Age* standards. Those that lag behind in strategic vision, realignment around technology, technology capacity, infrastructure, technology education, and establishment of support structures will be unable to fulfill their mission of preparing students for the future.

Technology has been a driver of change in such diverse areas as global communications, economics, the arts, politics, and environmental issues. While the world of business has readily adapted to and thrived upon technology innovation, the world of education has been relatively slow to reform. Although technology itself has not been a driver of change in education to the same extent as other segments of our economy, it can facilitate change and must be present for the paradigm shift required to achieve significant and continuing increases in student achievement.

Vision is needed to create new communication strategies, new paradigms for financing, new models for assessing success, and new models for educating. Providence School Department (PSD) has already begun much of this process including intense work on standards, infrastructure development, alliances with businesses and universities, and the recognition of the need for long range Technology Planning.
Our changing society and workplace require citizens who can take responsibility for their own learning and well being on a life-long basis. In addition we need these citizens to be able to work collaboratively, innovatively, and creatively. Educational reforms that help develop our citizens require a dramatic retooling of public education to leverage the power of technology in creating new and different learning environments. **The time for the PSD is here to think and plan strategically to further enhance comprehensive technology use in all facets of our operations.** The rate of knowledge generation and the corresponding demand for its use are rapidly increasing. We need citizens who can manage this vast increase in information. The life cycle of information continues to shrink. Much of what was learned a few years ago is no longer relevant.

Restructuring for the infusion of technology within an educational environment requires simultaneous changes throughout the entire organization and community. Teaching methods have to be modified, curricula updated, parent-school relationships modified, and organizational structures changed to expand communication and collaboration options. New technology is of little value if teachers do not use it or do not have access to staff development aimed at building their proficiencies in this area. Classroom support for their efforts at integration is also critical.

The *Digital Age* is representative of a time where the volume of information is increasing exponentially while its life expectancy declines at about the same rate. In the early 90's, there were less than 50 viable sites on the World Wide Web. Today there are over 50 million and that number is increasing daily. To operate successfully in the environment, schools must change their philosophy about how they collect, manage, distribute, and control information; **and** about their role in society.

It is important for the future that schools produce critical thinkers capable of learning and navigating through vast amounts of available information. Many teachers use technology but do so merely as an extension of the existing learning model. The teacher must reconsider his/her role as the source of information and the student as

the passive learner. Students must develop the skills necessary to become lifelong learners for individual success as well as for the economic stability and development of the community. This requires the interweaving of content objectives, process skills, and technology competencies at all levels of instruction as well as an extensive reformation in how we perceive teaching and learning. **First and foremost, students must be able to access information, manipulate data, synthesize concepts, and creatively express ideas to others using video, text, and audio media**. Technology can virtually bring the world to the child and provide teachers with a depth and richness of instructional approaches never before possible.

With the establishment of academic standards, technology can bring greater efficiency to both the instructional and administrative realms. This is especially important as teachers begin to use performance-based assessment to validate student learning and to maintain detailed records and learning profiles for all students. The role of the teacher and administrator must expand into new frontiers. They will be mentors, architects, navigators, evaluators, synthesizers, analysts, and policy makers and assume any other role that will assure student success and overall department success. They will be the designers and visionaries who will make technology implementation in the classroom and department a success. This new role of the "*teacher as a facilitator*" of learning rather than primarily a presenter of knowledge represents the major "paradigm shift" envisioned in the new Teaching and Learning Model put forth in the 2007-2010 Technology Plan.

Administrative personnel must lead the way toward change. They must make clear strategic decisions and provide adequate support and technology education while creating technology-enriched learning environments in which people can do meaningful, quality work. They must, however, have access to decision support systems that can provide them with timely access to information that guides adaptations in the learning system for improved, better-targeted instruction.

1.2 Statement of Guiding Principals

The Providence School Department is committed to educating all students in a child-focused, supportive, heterogeneous, age-appropriate, dynamic classroom and school environment. This commitment is based on the belief that every student has the right to achieve his or her potential within society. At the foundation of the Department's performance-based approach to curriculum design and delivery is a set of guiding principles that underscore the Department's commitment to students. Those guiding principles are:

- All students are capable of learning, and there are no limits to learning.
- The dignity of the student and respect for his or her present circumstances and cultural and language diversity should always be affirmed.
- Each student learns in his or her own way and at an individual pace.
- Learning is both an individual and social process.
- Learning requires the active participation of the learner.
- Caring, sensitive, and respective adults heighten the student's desire for learning and create conditions for success.
- The school, community and family must act in collaboration to support the student's learning.

Embedded in these principals is the commitment that all students will achieve the same content standards and acquire the same foundational skill as described in the Department's curriculum documents. The infusion of technology into the curriculum, the placement of suitable and appropriate technology into the Department's classrooms and other learning areas will play a major and strategic role in ensuring that student goals are achieved.

The following technology related principles must guide strategic-design decisions for the implementation of the Providence School Department' Technology Plan 2006.

- Technology systems and resources must have a significant positive impact on students in the classroom.
- Students must have equal access to technology and its benefits.
- Timely, extensive, high quality training for teachers, administrators, and other staff must accompany introduction of new technology.
- Implementation strategies will be highly flexible to meet the rapid rate of change in technology.
- The Department will seek the most cost-effective ways to meet constantly changing conditions.
- Networks are the key to maximizing the potential of all technology components.
- Networked, readily accessible management information systems are necessary for efficient and effective management practices.
- Investments in technology must be sustainable.
- Technology staffing and funding at the department- and school-levels must be sufficient to ensure timely maintenance and effective use of resources.
- The proposed strategic design is guided by key operating assumptions and technology design decisions.

1.3 Assumptions/Beliefs about Technology Utilization

Consolidation of staff philosophy, thoughts, and aspirations for technology applications is an important aspect of the Technology Planning process. The following assumptions about technology use were developed during the initial meetings with the Department's technology, instructional and administrative staff. It is important to note that no priority is intended by sequential statement of the assumptions. The following statements were posed to staff and others with a stake in the educational process:

"Technology utilization should result in....."

"The purpose of introducing new technologies should be....."

"Technology should provide....."

"The use of technology will facilitate....."

The statements above resulted in the following beliefs:

- Technology should support the desired student learning environment which is:
  - Learner centered
  - Project based curriculum
  - Active
  - Multi-sensory
  - Multimedia
  - Individualized/small group instruction
- Technology should support the desired learning environment where students can acquire the following skills:
  - Critical thinking
  - Problems solving
  - Team building
  - Use of and sharing information and ideas
  - Learning to learn
- Technology should support the desired learning environment where teachers can become:
  - Facilitators of instruction
  - Managers of instruction
  - Student coaches and mentors
  - Student motivators
- Technology should be used to facilitate teacher administrative tasks, which provides better time management and increases the instructional efficiency of teachers.
- Technology utilization will result in graduates having computer literacy skills, which will allow them to prepare for college entrance or the world of work and become effective and productive members of society.
- Technology should facilitate more active student learning, student autonomy, and individualization of instruction while increasing the student's' responsibility for his or her own learning.
- Technology utilization should provide increased student access to information, increase the student's skill in using technology, enhance the student's ability to evaluate information, and improve student achievement.
- The purpose of technology utilization is to enhance, not change, the curriculum and offer teachers the opportunity and framework to become more effective in developing and delivering dynamic curriculum. Technology should facilitate the process of change toward a learning environment in which the teacher is less a provider of information and more a facilitator of learning.
- Technology is a tool for students to use to foster creativity and critical thinking in a cooperative setting while encouraging individual growth.
- Technology utilization is based on the premise that it will result in increased multi-dimensional learning applications, enhanced student critical thinking skills, and provide a broader more integrated curriculum consistent with the school's mission statement and philosophy.
- Technology should provide an information-rich environment in which students are encouraged to access and manipulate information and which supports their

creative decision-making processes. Access to information via technology needs to be equitable and easy with particular attention paid to confidentiality and security.

- Technology should facilitate individual student needs, promote dynamic inter-active learning, and provide students greater opportunities to construct informed conclusions.
- Technology should prepare students to live and work in a changing global society and expand their enthusiasm for life-long learning.
- Technology should provide tools to assist students to learn how to learn.
- Technology should be "transparently integrated" into the learning process in such a way that it provides a vehicle for greater use of critique, extrapolation, creative problem solving, and analysis.
- Technology should provide better communication (collaboration) among staff, students, and parents. Better communications is seen as greater, faster, and more responsive interaction while maintaining or increasing direct face-to-face contact.
- Technology will allow teachers to have access to a greater variety of learning strategies and on-line instructional materials to support a wider range of student learning styles.
- Technology will result in a greater strain on financial resources and physical facilities and must be supported through planning, staff development, parental, and technical support. Significant increases in the amount and type of teacher training will be required.
- The effective implementation of technology requires a significant change in teaching style and is dependent on a positive attitude toward change. Technology utilization will place greater demands on teachers.
- The integrated technology infrastructure will support decision-making, staff productivity, and the teaching/learning environment. Priority in the development and deployment of technology resources and initiatives will be given to the department's core business—teaching and learning.
- Information will be available when, where, and how it is needed to facilitate the generation of knowledge, good decision-making, and a fully informed public. Everyone in the Department and in the total school community will have access to and be prepared to use information to support his or her learning and work.
- Technology will be viewed as a mission-driven line activity rather than as a technology-driven staff function. Funding decisions will be made on the basis of value, that is, the contribution of the technology to high-performance learning and informed decision making.
- Parents and other community members will have an active role in planning and supporting the implementation of technology in schools through the school improvement teams (SIT).

1.4 Technology Design Decisions

The following technology design decisions will guide the procurement and design of technology systems within the Department:

- The integrated technology system will be accessible to teachers, staff, administrators, students, parents, and the community as established by Department policy and the Providence One Plans. Nonetheless, it will be highly protected with security measures to prevent and detect unauthorized access to information.
- The integrated technology infrastructure design will be based on vendor-neutral, open standards to the extent feasible.
- The information system will be based on a distributed architecture, allowing applications on different computers and operating systems to exchange data.
- Security will be defined by roles, which will regulate access to data elements and functions performed.
- The network will integrate voice, video, and data communications services, providing seamless communications within PSD and with the world.
- There will be well-designed standards for procurement, maintenance, and technical support as well as a uniform system for establishing, disseminating, and monitoring policies and procedures regarding technology.
- Standards for workstations and other technology components will be established and enforced.
- Database management software will be relational and accessible on a variety of operating systems and hardware platforms.
- Information management will allow data to be entered, queried, analyzed, downloaded, and retrieved by authorized users.
- Wherever possible, information will be gathered where it is created, entered once and validated at the entry point, with the ability to identify who entered the data and who audited the information's accuracy.
- Customer support services will be expanded and strengthened to accommodate the expanded customer base accessing the system. Student technologists will be active participants in the installation, maintenance, and support of technology to the extent possible.

1.5 Technology Mission Statement

A technology mission statement is a clear, concise, and complete affirmation of the department's desired purpose of technology utilization. It is more a statement of what "*is desired*" or to what the school aspires, as what "*is today*". It is clearly a statement of the future, which encapsulates the overall philosophy and strategy of how technology should be utilized to meet the department's instructional goals. The mission statement below is intended to reflect the thinking expressed in the Department's commitment to the Whole School effectiveness reform program and enhance the statements of technology utilization beliefs to follow.

"To prepare the Department's young men and women for the challenges of tomorrow and to become productive citizens in an evolving world, Providence School Department will plan, design, implement and utilize technology to enhance the curriculum and improve instruction in classrooms and all other learning areas. Information technology will be used facilitate the implementation of the new Teaching and Learning Model put forth by the Technology Plan's Central Premise and to assist students think, learn, and develop the ability to access, analyze, and communicate information. Technology should also increase the student's responsibility for his or her own learning and empower them to be agents for their own education, enhance cooperative learning and critical thinking while facilitating administrative tasks and classroom management. The Department is committed to providing equitable student and staff access to technology and to the extensive staff support and development necessary to accomplish this mission."

1.6 Technology Vision

How will things change for tomorrow? What are the technology trends that will make education different in the future? What impact will tomorrow's technology have on how we design schools and layout classrooms today? One does not have to be a futurist to visualize tomorrow's school environment. Most of the components can be found in today's society, a few even in today's classrooms. Many more technology components, however, are still in developmental stages. It is the responsibility of the PSD Technology Department to aid in the design of learning environments that make effective use of today's technology and provide a degree of affordable future proofing of the communications infrastructure for tomorrow's technology.

The following discussion addresses, for the architect's design team, the impact of future technologies in education and desired changes in learning styles and methods on facilities design. Some of the major considerations are:

- The existing classroom environment will continue, but with the teacher being supported by enhanced technological administrative and instructional systems. Technology will allow the learning environment to contain the following desirable features:
  - Small-group instruction
  - Individualized instruction
  - "Non-paper" instructional materials
  - Collaborative, multi-sensory instruction
  - On-demand access to information and resources
  - Exploratory, intuitive-based
- The general-purpose computer lab will become decreasingly necessary. Each classroom will have the capability of being or becoming a computer lab, as each student has his or her own small laptop or other type of individual computer device connected via wireless to the hard-wired school-wide data communications infrastructure.
- The design and layout of classrooms and all other learning areas must change to accommodate new teaching and learning environments.
- Technology intense (high band-width requirements) computer labs, such as technology education or media/information technology pathway labs, will continue to exist and contain high-end desktop computers "hard-wired" attached to the school-wide data communications network

- The media center (information resource center) will continue to function as the technology distribution center of the school, housing the main head end room for voice, video and data, large group presentation area(s), open access mini computer labs (electronic cafes), digital media production facilities, and student research and information access workstations.

- One-to-One E-Learning environments will be supported by a hybrid hard-wired and wireless communications infrastructure, utilizing a combination of traditional telecommunications room and fiber optic based "collapsed backbone" topology to provide each school with seamless data connectivity.

- The new educational environment will be characterized by greater parental involvement and responsibility in the teaching and learning provided to the children.

- Technology related instructional spaces in schools must be planned using the best possible direct access for community use during after school hours.

- Students and staff will work towards attaining a technology "comfort level" as technology becomes a "seamless and transparent" everyday part of the learning environment.

The technologies expected to play an important part in facilitating this new learning environment are:

- Large-screen wall presentation of video-display systems

- Individual laptop or other personal computer devices for all students

- Wireless network communications within the classroom

- Advanced interactive software

- Distance learning capabilities in multiple learning areas

The two major technology trends evolving in today's society that will have significant effects on instruction and learning are wireless connectivity and digital video presentation and distribution systems.

- Wireless connectivity provides classrooms and other locations in the school with flexible and mobile access to resources beyond the classroom. It uses telecommunications principles, already so much a part of today's society, to enable teachers and students to communicate with people and resources within the school and around the world. Wireless connectivity, coupled with laptop or other individual computing devices for all students, will lead to extensive use of One-to-One Electronic Learning in classrooms and all other school spaces.

- Integrated voice, video, and data building-wide communications networks are extending these benefits, as well as the instructional capabilities of media centers, computer labs, and TV studios to all classrooms and instructional spaces.

A classroom computer workstation or laptop located at the teaching station with building-wide network access will enable a teacher to:

- Connect directly to an information source;

- Present information to groups of students;
- Expand the classroom by communicating with other schools, cities, cultures, and countries.

Technology can link teachers to curriculum sources. Teachers can use a computer to access a central location to gather a list of resources and activities for the lesson being taught. They can join other creative teachers on a network to share and field-test lesson plans, adjusting them as necessary for their students. With these tools, teachers can create and present content lessons in a multi-media format designed to explore "what if..." questions.

In summary, the significance of these computer trends are that they allow teachers to: (1) better address higher order thinking skills; (2) meet the individual needs of a more diverse student population; and (3) change their role from an information dispenser to an instructional facilitator.

Most of this is possible because of the continuing trend towards the miniaturization of computers. The price/performance ratio will continue to decrease as their value/performance increases. Computers will be enhanced to include multi-sensory/multi-media capabilities. Digitized audio and video, graphics, and the storage of large volumes of data will become common features of most microcomputers and, thus, greatly enhance the usability of small notebook size computers. Voice recognition may replace the keyboard and mouse as the primary means of interfacing with the computer.

It is envisioned that each student will someday be assigned a personal notebook or other type of computing device to use both in school and at home. The computer will have: (1) wireless transmission capabilities for networking to local file servers; (2) the capability of attaching to any building-wide digitized two-way distributed video outlet; (3) a miniaturized CD-ROM type-high volume multi-media device; and (4) two-way voice recognition communications capabilities.

The student will carry his/her personal computing device from class to class and have the capability of wireless communication connectivity with any file server in the building. All file servers in the building will be physically connected via low cost high capacity copper/fiber cable. The student can use his/her computing device from a desk, small discussion group, the media center, other instructional support facilities, or home. The student can obtain (download) software or send (upload) performance data to the local classroom file server. By passing through the local file server, the student will have access to any other file server in the building, or with proper safeguards, access to file servers and mainframe computers elsewhere in the school or around the world. A single larger client server with mainframe architecture may become an effective alternative to the large number of smaller file servers.

1.7 Implications for the Learning Environment

Much of what has been described above is possible today. In order for the technology of today and tomorrow to be effectively utilized, it must be fully integrated into the curriculum and made available when instructionally appropriate in the school environment. This will require a few fundamental changes in school system policies and standards of instructional practice.

First, technology must become an integral part of the curriculum and the physical environment, not an add-on.

Integrating technology into the curriculum means changing the process of institutionalized learning, which is basically the same today as it was 90 years ago: A teacher using text and reference materials to instruct a roomful of students. New computer and related technologies enable teachers to provide individualized instruction, where students make meaningful progress at their own pace. Integration of technology and curriculum implies a teacher-decision model that unifies curriculum strategies and technology-enhanced instruction and student learning.

Second, students must become more active educational participants in the restructured classroom of the future, not simply receivers of information.

The base of knowledge is expanding too quickly for students to be passive learners. They must become processors and appliers of facts and data. Success in the Information Age will be predicated on the continual application of information and skills to real world situations. Thus, learners will spend a greater percentage of time engaged in project-oriented activities and simulations of real work experiences.

A third significant shift must occur in the role of the teacher in the restructured classroom of the future.

- The effective integration of technology will require that teachers no longer be trained to lecture and meet student-learning objectives primarily through textbooks and workbooks. Instead, they must be teachers who are managers of a complex educational environment, designers of an individualized learning program for each student, facilitators of learning, and caring coaches guiding students toward academic and personal goals.

- Over the long term, technology has the potential of becoming the change agent for re-structuring education. Technology will help increase the percentage of time of a student's "mind-on-task." Many believe that motivation is the single most important element in learning. As students continue to be exposed to an ever-increasing technological world outside the school, it becomes increasingly difficult to motivate them in a low-tech learning environment.

Fourth, the layout and design of individual classrooms and other learning areas must reflect the integration of technology, the increased activity of students in their own learning, and the changing role of the teacher.

This fourth implication is the main purpose of the Plan Document. If the learning areas coming forth from the new school construction program are to truly reflect the departments desired learning environments, then the architect must place greater emphasis on:

- Ensuring that the educational specifications reflect the desired teaching and learning environments.

- Translating the impact of these teaching and learning environments on classroom and other learning area layout and design.

- Ensuring that all learning spaces meet the department's basic tenets for standard learning areas.

- Translating the impact of these teaching and learning environments on the schematic design of the building.

- Ensuring that the appropriate technology is selected from the departments' standards to match the specific schools' functions and student target population.

1.8 Inhibitors and Critical Issues

From discussions with Providence School staff and the experience of ESP, the following critical issues have been identified that, if not properly addressed, could significantly detract from the effective design for and utilization of technology as proposed in the Technology Plan. The following "inhibitors" or "critical issues" were identified and are highlighted to ensure their consideration in current and future planning. No priority is implied by the order presented. Several of the critical issues require little explanation. It should also be noted that many of the issues are interrelated, and addressing one can have a significant impact on others.

- *Initial and continuing budget allocations*

The high cost of purchasing hardware, software, support and the other aspects of technology is a frequently cited inhibitor to integrating technology in the learning process. Too many school departments make the mistake of budgeting only funds for hardware and software and not adequately providing funds for training and personnel support. The exploration of creative financing, coupled with a well conceived detailed Technology Plan and fund development program, can go a long way in providing initial and continuing financial support to technology implementation.

- *Time*

PSD should be conscious of the fact that making the teaching and learning paradigm changes described herein, in classroom and other learning areas through the use of technology, takes time. At least initially, technology implementation is an "add on" to the normal instructional commitment of teachers. It is important to recognize that effective implementation will require planning time, time for staff development and training, and time to integrate technology's use into the traditional classroom environment. Teachers will require varying amounts of time to become comfortable in the transition to the new role required of the new Teaching and Learning Model. Support for additional time can be provided in various creative ways, from release time, reduced teaching loads, to shared responsibilities.

- *Staff development and training*

A major issue in the successful implementation of technology is how to provide the staff development and training required to:

- ❑ Ensure that all teachers acquire basic computer utilization skills,
- ❑ Ensure that teachers have skills required to access and use classroom assessment tools,
- ❑ Provide in-school facilitation support to encourage and increase the use of existing computer equipment and software, and
- ❑ Assist teachers to explore new and innovative applications of technology.

A major challenge in achieving technology's potential as a change agent for restructuring education is its implementation as an integral part of the classroom-

learning environment; the success of which depends heavily on the teacher's ability-- both technical and educational-- to fully utilize the advantage of technology. Some teachers will acquire the basic level of technical skills on their own initiative and will encourage students to use available technology. Other teachers will require more training and encouragement. Staff development programs need to be tailored to the existing skills and experiences of individual teachers. A strong on-going staff development program is vital to successful technology implementation.

- *Teacher input and consensus*

The following is adapted from the May 1, 1996 issue of EDUCATIONAL WEEK and illustrates the importance of the teacher's role in the teaching and learning paradigm shift.

- For teachers to integrate technologies into their curricula requires changes of huge magnitude in educational philosophy, classroom management, and curricular goals. Classroom teaching and learning will not improve automatically by the introduction of computers and communications techniques. For the technologies to be used optimally, teachers must be comfortable with a project-based, problem solving approach to learning; they must be willing to tolerate students progressing independently and at widely varying paces; they must trust students to know more than the teachers do about certain subjects and techniques, and to take on the role of expert teacher at various times; they must be comfortable about having control over what resources the student accesses or what the student learns, and they must be flexible enough to change directions when technical glitches occur.

The adaptation of a 1996 article into a 2007-2010 Technology Plan plainly illustrates the importance of this critical issue and the fact that it remains as an inhibitor and must be addressed in order to achieve student achievement gains. Not everyone deals with change at the same pace. As noted above, the scope of change required to integrate new technologies is enormous. We are asking teachers to undergo profound belief and habit transformations. Technological change will never be as smooth as one would like.

- *Administrative and Teacher Commitment*

The commitment of administrative staff and teachers is both an initial and continuing factor in the effective implementation of technology. The full commitment of the principal and a small group of teaching staff is necessary to initiate the planning and use of technology. It is important that initial efforts be rewarded and capitalized on as the planning and installation of technology continues. If support is provided to this initial group, successful results will overflow to additional faculty as technology utilization increases. The foundation of technology use should be built on the work of those teachers who are most interested. Successful role models should be highlighted to the entire faculty.

Administrators can -- and should -- play a primary leadership role in helping overcome technology barriers, but they will need courage to confront the issues. Navigating into the 21st century with technology will require a new kind of leader -- one who can learn from the past to develop a new vision based on future ideas, experimentalism, and a passion to explore the unknown.

- *Proper Planning and Decision Making*

The integration of technology into the school culture requires long-term strategic planning. **Those responsible for Technology Planning need to realize that such planning must be based on the premise that "the future will be different from the past" and that one must envision the future rather than merely extrapolate "the past into the future."** Technology Planning must be aggressive. The Technology Plan must be continually reviewed and updated to maintain currency of both technology and instructional applications.

The inability to make decisions or act on convictions is a serious inhibitor to technology implementation. Administrators and technology leaders can overcome their own hesitation by:

- ❑ Getting involved NOW rather than later. Overly conservative attitudes toward technology integration will not allow students to compete in the next decade and beyond.
- ❑ Not waiting until the "new stuff" becomes available. Educational technology changes are rapid with the shelf life of new technology products being three years or less. Leaders must plan far enough in advance to get the maximum benefit on the technology purchase while recognizing the need to continually upgrade both hardware and software.

- *Facilities and Space*

PSD should feel strongly that the design and layout of classrooms and learning spaces in new and modernized schools must reflect the departments desired teaching and learning environments. Likewise, schematic designs reflecting learning space adjacencies must also reflect the integration of technology into classrooms and other learning spaces.

New and modernized schools need communications infrastructure, which can meet today's technology connectivity requirements and be robust and flexible enough to embrace future requirements.

- *Staff Technical Support and Maintenance*

Another major issue is how to provide the central and school based technical support needed to:

- ❑ Utilize the building-wide computer and video networks and computer equipment,
- ❑ Provide computer maintenance on an increasing number of computers, printers, and other equipment,
- ❑ Facilitate in-school familiarization with new software products and innovative applications of computers, and
- ❑ Facilitate in-school dissemination of software utilization procedures and suggestions of integration into the classroom.

The recent publication, The Connected School, Center for Technology in Learning, 2001, listed the following reasons why student-empowering uses of technology are not more common in public schools:

- Lack of technology infrastructure
- Lack of technical support
- Teacher discomfort with technology
- Scarcity of high-quality digital content in many subject areas
- The constraints of academic schedules and departmental structures

It is obvious that, while facilities and technology design of learning spaces is extremely important, there are numerous other people and material oriented criteria for success that also have significant impact on successful implementation of the department's technology supported desired learning environments.

Chapter 2 Technology Utilization

Central Premise of Technology Plan

Significant and continuing improvement in student achievement requires:

- **A major paradigm shift creating a new classroom Teaching and Learning Model where;**
  - **The teachers' role changes from predominately lecture to that of a facilitator, mentor, and manger of instruction;**
  - **Students become active participates in a collaboration, project based, small group learning environment;**
  - **Students acquire critical thinking, problem solving, information analysis, and life long learning skills;**
  - **Parents and community are engaged; and where**
- **The new Teaching and Learning Model is effectively supported by an infusion of ubiquitous classroom technology.**

This Chapter contributes to the Central Premise by:

- presentation of necessary goals
- discussion of the major components of the new Teaching and Learning Model presented in the premise.

Chapter 2 Technology Utilization

2.1 Overview

The overall approach taken in the development of the Technology Plan 2007-2010 has been to develop a central premise around the Department's three major goals, which are to:

- Increase student achievement,
- Create capacity to support continuous learning environments, and
- Strengthen parent and community engagement.

The following central premise is somewhat bold but probably reflects where education must be headed in order to truly improve student achievement.

Technology Plan Central Premise

Significant and continuing improvement in student achievement requires a major paradigm shift creating a new classroom teaching and learning (T&L) model where;

- **The teachers' role changes from predominately lecture to that of a facilitator, mentor, and manager of instruction;**
  - **Students become active participants in learner-centered, collaborative, project-based learning situations;**
  - **Students acquire critical thinking, problem solving, information analysis, and life long learning skills;**
  - **Parents and community are engaged; and where**
- **The new Teaching and Learning Model is effectively supported by an infusion of ubiquitous classroom technology.**

All aspects of the Technology Plan are designed to provide the necessary support to allow technology to facilitate the proposed major paradigm shift. The writers of the plan appreciate that this is huge undertaking and will require significant resources currently not available to the department. Of major significance is the teacher's role change from predominately lecture format to that of a manager of instructional activities and the necessary expansion of skill sets it will require of many teachers. The new Teaching and Learning Model which is proposed by the premise will also require a re-focusing of technology equipment and resources from locations outside the classroom to complete integration into classrooms, science labs and other learning areas. The Technology Plan proposes an implementation composed of three components:

- A full scale implementation of the new technology supported T&L model in three demonstration schools; an elementary, middle and high school.
- Continued enhancement of existing and additional technology re-focused toward the classroom in all remaining schools. A new technology supported T&L model demonstration classroom is to be phased into each school to serve as model classroom and professional development center.

- ❑ All new and modernized schools are to be designed and staffed for full implementation of the technology supported new T&L model.

It is understood that the full phased implementation of the technology supported T&L model proposed by the premise will take considerable time, must be well planned and financed, marketed well to teachers, the union, staff, students and the community. Technology goals are divided into those directly related to the central premise and those that are supportive.

2.2 Summary of Goals

The following 14 goals have been identified as milestones that will enable the teachers, students and community to migrate towards the new Teaching and Learning Model (refer to 5.2 Action Plan for a more detailed summary and explanation of each individual goal):

Goal 1
Continue to upgrade the existing communications infrastructure and networks in all schools to support the Technology Plan

Goal 2
Upgrade the Communications Infrastructure in non-demonstration schools to support refocusing of technology access from computer labs to classrooms and the creation of one technology supported new T&L model demonstration classroom which comes as close as practical to replicating the classrooms in the demonstration schools.

Goal 3
Select and upgrade the Communications Infrastructure in the three schools to be demonstration schools to meet the criteria for voice, video, data, and security systems and Communications Network Outlets (CNO's) necessary to support Teaching and Learning Model described in the central premise. Identify, select, design and implement an elementary, middle and high school demonstration centers that models the complete learning environment defined by the central premise.

Goal 4
Review, modify and adopt standards to ensure that all modernized and new schools meet the Communications Infrastructure criteria for voice, video, data, and security systems and Communications Network Outlets (CNO's) described in Chapter 4.

Goal 5
Equip all classrooms, science labs, and other learning spaces in the demonstration schools and demonstration classrooms of other schools with the appropriate technology equipment to support the new Teaching and Learning Model described in the central premise.

Goal 6
Create an environment and provide the resources that will allow all teachers to attain the skills necessary to become effective managers and facilitators of instruction.

Goal 7
Create an environment and provide resources that will allow all students to equitably obtain access to and use the technological and social skills required to thrive in the new T&L model and function successfully in the twenty-first century.

Goal 8
Implement a technology based classroom assessment and instructional management system that will allow teachers to become efficient managers of every student's learning plan.

Goal 9
Develop and/or obtain a web-based, integrated curriculum and learning system that links curricular, assessment and instructional resources.

Goal 10
Engage parents and community in the planning, design and operation of the learning environment defined by the central premise.

Goal 11
Provide resources necessary for a plan to provide the technology staffing support necessary to implement the technology based Teaching and Learning Model put forth in the central premise.

Goal 12
Develop technology fluent school and central office administrators.

Goal 13
Utilize technology to transform business applications

Goal 14
Create technology standards and policies that will aid the school system in implementing the goals set forth in the Technology Plan

Section 2 of the document is organized around the topic areas of significant importance for the implementation of the new Teaching and Learning Model described in the central premise. The major topic areas are:

- Communications Infrastructure and Equipment
- Professional Development
- Student Technology Initiatives
- Curriculum and Assessment
- Community Development
- Technical Support
- Administrative Applications
- Technology Standards and Policies

Each topic area describes one or more of the major goals summarized in Section 2.2 and is detailed in the Section 5 Action Plan.

2.3 Communications Infrastructure and Equipment

To realize our new Teaching and Learning Model in the classroom, a physical infrastructure must be in place to support the heavier requirements of bandwidth, and also provide a safe and reliable structure for future growth. Providence School Department has been diligently working on improving the central pathways between schools and the main office, to begin the centralization and standardization needed to manage a large network with few technicians.

The communications infrastructure described in this section is intended to support the three major components of this plan, which are:

- Continued enhancements of existing and additional technology re-focused toward the classroom in all schools. A new technology-supported T&L demonstration classroom is to be phased into each school to serve as a model classroom and professional development resource.
- A full-scale implementation of the new technology supported T&L model in three demonstration schools: an elementary, middle and high school, as defined in Chapters 3 and 4.
- New and modernized schools are to be designed and staffed for full implementation of the technology supported new T&L model, as defined in Chapters 3 and 4.

- *Goals*

The following five goals of the Action Plan specifically define the infrastructure and equipment required for these components. The goals are to:

Goal 1: Continue to upgrade existing communications infrastructure and networks in all schools to support the Technology Plan.

Goal 2: Upgrade the communications infrastructure in non-demonstration schools to support re-focusing of technology access from computer labs to classrooms and the creation of one technology supported new T&L model demonstration classroom which comes as close as practical to replicating the classrooms in demonstration schools.

Goal 3: Upgrade Communications Infrastructure in the three schools to be demonstration schools to meet the criteria for voice, video, data, and security systems and Communications Network Outlets (CNO's) necessary to support Teaching and Learning Model described in the central premise.

Goal 4: Review, modify, edit and adapt standards to ensure that all modernized and new schools meet the Communications Infrastructure criteria for voice, video, data, and security systems and Communications Network Outlets (CNO's) described in Chapter 4.

Goal 5: Equip all classrooms, science labs, and other learning spaces in the demonstration schools and demonstration classrooms of other schools with the appropriate technology equipment to support the new Teaching and Learning Model described in the central premise.

- *Guidelines for Technology in Schools*

Traditionally, funds for technology in schools has come in increments aimed at one specific area such as PCs in classrooms, network electronics, intercom systems, surveillance systems, etc… With more and more systems present in schools today, some general guidelines will help to maximize investments by reliance upon industry standards and commitment to proven technologies.

A primary rule in deploying technology is to avoid proprietary solutions wherever possible. A system that can be utilized over multiple systems and operate with legacy equipment will generally prove more cost-effective than a proprietary system that may have more bells and whistles upon initial deployment. An example of this principal is

the VHS and BETA VCRs brought to market in the 80s. Early implementers of this technology bought BETA machines which became unusable as the VHS standard was adopted, and tape manufacturers failed to support BETA formats. Wireless standards in the last 10 years have followed this pattern as certain manufacturers have committed to one or another protocol.

Providence Schools must maximize the return on its investment in technology systems. Therefore, there must be a commitment to standards in deploying technology. ANSI TIA/EIA standards are critical to long term success of any infrastructure put in place. Other trade organizations such as BICSI can provide training for support staff, publication of industry trends and long term commitment to standardization in the telecommunications industry. Security equipment across the Department should function similarly from school to school, so that technicians and support staff can be utilized across the city. Also, any central office applications have to be able to communicate with any school in the Department in the same manner.

- *Basic Considerations in All Schools*

In aging schools, one of the largest challenges to activating and protecting technology investments is clean and sufficient power. Most of the schools in Providence were constructed before the idea of placing 8-10 electronic devices in each classroom was understood. The addition of multiple PC's, a television, DVD/VCR and a ceiling-mounted projector requires additional circuits so that the equipment can be powered and used without blowing breakers, or damaging the equipment due to aging power equipment in the school. At a minimum, investments in network electronics at each school should be provided with UPS electronics and power conditioning equipment so that surges, lightning strikes and even brownouts do not damage expensive equipment necessary to run any application over the network.

Even when considering laptop or tablet PCs, power is one of the most critical issues for deployment. While laptops are excellent for reaching a 1:1 student/PC environment, the laptops are impractical choices, unless the units can be charged and ready for use. A mobile cart can be equipped to recharge laptops, but space and the proper power supply needs to be in place for scheduled re-charging. Also, multiple carts are recommended so that one is available for use when needed.

Installed correctly, technology can be a seamless part of educational facilities. However, all applications of technology require support systems not always considered before deployment. In order to connect to a local area network and Internet, areas must be reserved and environmentally protected for technology. Chapter 3 describes in detail requirements for telecommunications rooms, but one of the greatest challenges to supporting technology advances in all Providence schools is space to support the local area network. Telecommunications rooms are necessary to keep network runs less than the standard 90 meters. In existing schools, network cabinets may be utilized if it is impractical to usurp the use of an entire room. Locations should be carefully selected and protected from high temperatures, casual damage, sources of water, and other conditions that will negatively impact technology investments.

The current plan for all Providence schools is to procure dual T-1 lines into each school. One will be dedicated to administrative support, and the other for application and Internet usage. Eventually, as the Teaching and Learning Model is implemented in all schools and classrooms, the amount of bandwidth will need to be increased and augmented by additional infrastructure. It is also important to consider some amount of redundancy in the Wide Area Network so that the schools are always connected to the central office in some manner. Satellite systems, wireless applications, and even cellular systems have been implemented by School Departments elsewhere to give a measure of security in case of disruption of service by the common connectivity method.

As more applications are introduced in each classroom, additional servers will be necessary to protect data, speed applications and host remote applications. The reliance upon these servers will also necessitate a plan that considers useful life, so that the costs of these servers are understood as not extending beyond 5 or 6 years. Also, the security of the servers needs to constantly be reviewed and monitored. Constant developments in spyware, viruses and other disruptive influences of shared resources make it important to develop policies aimed at securing data and protecting networks from unauthorized access. As more student data is recorded and tracked by software the potential from unauthorized access grows in importance. It is of primary concern that networks are scrutinized for security holes, and proper funding and attention are put in place to protect the data.

Currently, the Department has been improving each site to receive two 2 T-1 lines with an OC-3 pipe back to the central office. This network currently supports the REG 2000 application, and allows administrative staff the ability to interact with the central IT department. In order to support a new Teaching and Learning Model, this connectivity has to be multiplied and extended out to each classroom. The infrastructure must fully support multiple network connections in each classroom, with useful applications on classroom workstations.

Another critical element of maintaining the push towards standardization is the need to maintain equipment for a usable life. It is important to budget and consider the best way to inventory and track aging among equipment. Usable life of a PC or laptop is not much beyond 5 or 6 years. Providence needs to maintain inventory records for equipment and all schools and develop replacement policies that keep equipment and licenses active and useful.

- *Demonstration classrooms*

In order to prepare students, teachers and administrators for the transition to a full implementation of the new Teaching and Learning Model, it is recommended to specify a single classroom in every school as a demonstration classroom. The presentation systems, wireless capacity and networked workstations will be added to the classroom, so that classes and teachers may realize the benefits of the new environment. Teachers will need time to learn how to best adapt their curriculum to this new environment. Also, the classroom culture will need to grow in order to encourage more opportunities for individualized learning. The LAN will need to be improved in each of the demonstration classrooms to support the 10 network drops intended for each of these classrooms. Power should be added in each location intended for networked workstations, and space and furniture for the technology-rich environment.

A wiring harness to the ceiling-mounted projector should be installed so that IT carts with multimedia equipment may be rolled into the classroom and interact with minimal setup time. And, most classrooms will need to be equipped with electrical outlets at a high television location (recommended at 80 inches above finished floor) or within 30 inches of a ceiling-mounted projector.

Wireless technology requires a minimum of infrastructure to be deployed, but each of these demonstration classrooms should consider the requirements. A network drop, sufficient power for recharging laptops or tablet PCs, space for use of the wireless equipment and the removal of interference are all important to guarantee the usefulness of wireless deployments.

The clearest difference between traditional classrooms and the demonstration classrooms will be the audio-visual presentation system. A true interactive system will allow the teacher to clearly share information from his/her PC, remote servers, Internet sources, or other multimedia sources on the network. Also, the classroom should provide space and power for a multimedia cart with the following equipment:

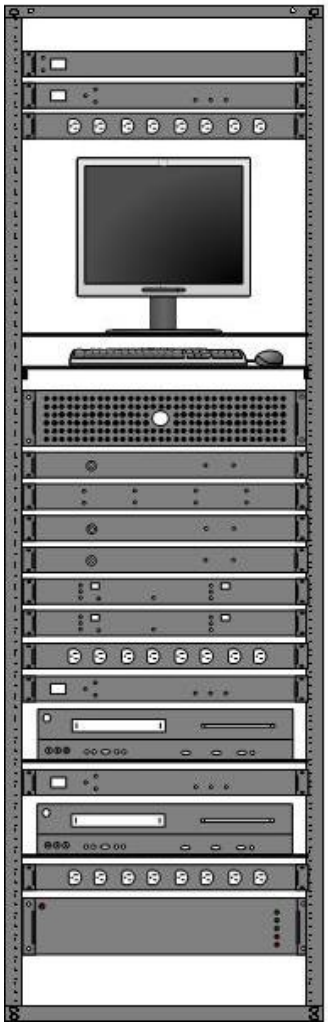
- ❑ Powered speaker system
- ❑ Stationary Document Camera
- ❑ DVD/VCR
- ❑ Laptop or Tablet PC
- ❑ Video Switch and Remote
- ❑ Cable Harness for full integration with Ceiling-Mounted Projector

- *Demonstration Schools*

Three schools should be identified to be fully equipped with the equipment necessary to make them fully functional in the new Teaching and Learning Model (reference Chapters 3 and 4). A robust infrastructure should be designed with switches and network electronics scalable for the addition of future systems onto the data network. Voice systems should be provided to improve direct communications between any parties in the school or even, school department. This improved communications will complement a security system comprised of intrusion detection, surveillance and access control equipment, truly informing the school department of real-time activities and events that need attention. With the recent strategic plan commissioned by the Providence School Department,

new schools will need to be constructed and it presents the perfect opportunity to realize the future of education in terms of technology applications.

Before committing to deploying the full Teaching and Learning Model, priorities should be assigned to the elements of the technology systems so that restriction of funds or other budgetary issues do not make the realization of the T&L model impossible. While it is highly recommended to install future-proofed security systems, it may be more practical to install the infrastructure to support an electronic access system, so that funds are available to implement a full CCTV surveillance system. Then, as funding becomes available, there are minimal additional requirements to install the electronic access control system. Without good understanding of the priorities, however, well intentioned designs will be value-engineered into the status quo, and delay the realization of classrooms equipped to educate students with today's available technology resources.



Models of specialized classrooms should also be developed and updated to take advantage of newer technologies in educating students in science, technology and media resources. Labs, media center s and other special classrooms have different requirements for space usage and technology systems. A well-developed design guideline can help to promote standardization amongst all Providence schools and allow teachers at each school a margin of comfort to teach in any of the schools. Also, this standardization of specialized classrooms could help Providence, in its allowance of parents and students to choose from amongst the schools from year to year.

Investment in these demonstration schools will greatly outweigh any previous technology initiatives, as the major systems include audio-visual presentation, CCTV surveillance, electronic security and a robust data network infrastructure. With 10 to 12 network drops per classroom, space for support electronics will need to be provided for in square footage allotments. With so much investment in technology equipment, security systems should be given high priority to protect that investment and also encourage use of the technology at other times, other than school hours. A two-way interactive video distribution system will allow for the collection of video resources rather than just displaying content on classroom screens.

Other technology features of these demonstration schools will include complete wireless coverage in the facilities. This fact alone removes any barrier or restriction to usability of the data network. Informal learning areas, temporary offices or even resources for training purposes can be quickly erected anywhere in the building with access to network resources. Administrators or temporary guests of the building can be given limited access so that productivity increases while on-site.

With so much reliance upon technology systems, it is critical that environmental concerns, security and other secondary considerations are met in these schools. A power outage would greatly disrupt classrooms, although the same could be said of current school conditions. Network downtime becomes of critical concern in the new Teaching and Learning Model, making strategies for on-site support of first priority. Also, to ensure operability of critical systems, backup power and emergency

connectivity with authorities (police, fire department, etc) must be engineered into these buildings.

One of the central premises of the new Teaching and Learning Model is that students are more able and interested in pursuing individualized learning, made more feasible through technology. Some of the latest initiatives developing this trend are cheaper and more portable applications of technology: the "$100 laptop", tablet PCs, PDAs, pod casting, etc… All of these gadgets get us closer to true 1:1 e-learning activities in any classroom. A plan to develop individualized equipment at a ratio of 2:1 (students:equipment) is desired in the new Teaching and Learning Model, to grow to 1:1 in the near future.

- *New and Modernized Schools*

With an upcoming building program, Providence is poised to implement 21st century construction methods to ensure effective models for education for the next 40 to 50 years. Again, emphasizing standards, designs for new schools should attempt to engineer enough capacity into buildings to address future needs (reference Chapters 3 and 4). Given the pace of technology, schools should not attempt to implement every new piece of available technology, but concentrate their budget towards building flexible and organic structured cabling systems that can take advantage of multiple technology systems over time. Pathways for infrastructure should be sized with room for up to 40% growth. It is easier and much more cost effective to plan for growth before the walls and ceilings are constructed.

Schools are aiming more and more towards training students to be active in a technologically advanced and global economy. As such, the schools we build for the future generations should have technology front and center in every model. Whether it is fostering communications to support education, shrinking the globe by bringing other cultures into the classroom through the Internet or remote access to foreign classrooms, tomorrow's classroom must be equipped to access all readily available resources.

Technology to be designed into new schools described in Chapters 3 and 4 can be summarized as:

- ❑ Wired/wireless structured cabling system
- ❑ Two-way, interactive video distribution system
- ❑ IP-ready voice system with the capability for phasing in classrooms
- ❑ Video presentation systems in all classrooms and learning areas

- Security systems, to include video surveillance, electronic access control and alarm/intrusion detection.

2.4 Professional Development

The learning environment put forth in the new Teaching and Learning Model (T&L Model) of the Technology Plan central premise places significant importance on the paradigm shift required of teachers. To be successful this change will require teachers to not only acquire technology skills but also to develop personal and teaching skills to fit the new environment. The teaching change required of teachers is the single most critical aspect of implementing technology into the new T&L Model and providing the opportunity for significant increases in student achievement. Likewise, school based administers need to provide modeling of technology utilization for students to follow. This section describes the actions and plans that are necessary to address the two Action Plan goals associated with professional development for teachers and administrators.

- *Goals*

Goal 6: "Create an environment and provide the resources that will allow all teachers to attain the skills necessary to become effective managers and facilitators of instruction."

Goal 12: "Develop technology fluent school and central office administrators."

In order for teachers and administers to create powerful learning experiences for children, they need to be engaged in the same technologies and learning trends as the children to whom they are guiding. This necessitates a learning culture that is focused on improving learning for the youth as well as adults within its bounds. Professional Development is an effective mechanism to promote continuous inquiry and improvement in both the educational and educational technology arenas.

The National Educational Technology Standards provide a framework that the school system is in the process of moving towards in developing their professional development programs. They incorporate the following 6 areas of development:

- Technology Operations and Concepts,
- Planning and Designing Learning Environments and Experiences,
- Teaching Learning and Curriculum,
- Assessment and Evaluation,
- Productivity and Professional Practice, and
- Social and Ethical Issues.

Using this framework, the Providence School Department is undertaking a three-phased process of professional development that incorporates education, training, and support. "Education" builds vision and awareness; "training" develops specific knowledge, skills, and behaviors (competencies); and "support" provides the ongoing reinforcement and assistance required for sustained learning.

- *Current Practices*

The school system has undertaken a major initiative to strengthen and broaden their professional development programs. Currently, each instructor is required to take 38-40 hours of professional development courses. Generally, these hours are provided by the department and are typically offered in a variety of workshop style environments, after school hours or during in-service work days. Approximately half of the programs are organized at the department level while the remainder is organized at the school level. Interest has been expressed by staff in using technology to deliver more varied and effective staff development options, such as distance learning; online tutorials, courses, and discussion groups; and Internet research. Another source of training already in place is the Department of Education and University of Rhode Island RITTI program. However, this program has not been widely used by principals and teachers.

Department workshop offerings are determined by the Teaching and Learning committee chaired by the Deputy Superintendent. During the month of February, planning for upcoming classes and workshops is developed so that local schools can plan their workshops around department offerings and be ready by end of school year. The Director of Professional Development has two dedicated staff members that assist in the planning and funding of the programs. The programs are funded by the school system and teachers are paid their regular salaries during attendance or provided an equitable reimbursement.

The types of classes offered focus largely on instructional practices with less emphasis being placed on basic technology tools and productivity tools that seem to be lacking across the school system. Consequently, there is a wide range of competency with technology among staff that is primarily based on personal interest and comfort levels with technology. Those that come to professional development workshops ready and eager to learn will often out pace those who are simply fulfilling the commitment since they bring a greater comfort level with them. Additionally, if a resistant user is not shown the efficiencies that can be gained through technology, they instead become overwhelmed by what they see as another layer of complexity further widening the gap between staff.

At this time, the Providence School's core technology competencies have not been documented for principals, school support staff, library-media staff, school and department technology support staff, and department-level instructional staff. This has made it difficult for staff to target their specific learning track to meet the demands required of them regarding implementing technology. Professional Development program descriptions have appeared vague making it difficult for staff to effectively select programs that will meet their needs. However, it should be noted that most staff do acknowledge the quality of the programs and see the benefits of attending once a program has been selected. Recently, a program was instituted where each school was given a technology coach that can assist other instructor's with technology needs. However, no job formal description has been produced for this position and subsequently the effectiveness has been moderate at best since there are no firm criteria that individual must meet or goals that should be achieved.

There is a need to coordinate all technology-related development activities so that staff development is efficiently and equitably delivered. Staff does not currently

develop multi-year individual staff development plans aligned with department/school/ department improvement goals and their own unique needs.

Under the current system, the Chief Technology Officer and Instructional Technology Coordinators have played a minimal role in the development of available programs. Much of the technology staff is concentrated on implementing, managing and maintaining technology systems and equipment for a large school system. As such, it has proven difficult to develop programs and workshops with sufficient input from the necessary experts since roles and relationships among department level staff development, instructional technology and technology staff are unclear. There is no single mechanism for managing human resource data aligned to student learning standards, Department strategic goals, and school improvement priorities but rather a fragmented framework.

It is recommenced that a task force be formed to address professional development sub-goals 6.1 through 6.3 to ensure that staff training opportunities and offerings match the teacher skill necessary for new Teaching and Learning Model to be implemented in the demonstration classroom planned for each school and the three demonstration schools as well as new and modernized schools.

- *Implementation Goals*

The Providence School Department is in the process of reforming and defining why and how professional development activities relating to technology are accomplished and are committed to increasing the use of technology within their curriculum. Five main areas have been established on the path forward:

- ❑ Technology Program Offerings
- ❑ Staff Technology Competencies
- ❑ Technology Support System
- ❑ Organizational Development
- ❑ Funding for Professional Development

- *Technology Program Offerings*

A single consolidated resource of professional development offerings related to technology should be created and maintained at the department level. In simple terms, this catalog should outline:

- ❑ The programs being offered with a clear description of the content,
- ❑ A mechanism of how the program is offered,
- ❑ Recommendation of who would benefit from the course,
- ❑ Minimum competencies required for attendance, and
- ❑ Competencies gained during the program.

A model should be developed on a department level basis and include offerings for all levels and staff. The model should outline required skill levels for administrators, principals, instructional staff and support staff. While this model should be developed

at the department level to consolidate management, it should include both department level training and school level training as the program exists currently. More specialized training tailored per grade level or position type should be included at the school level to allow for more customization. This approach will also allow for a more focused offering that provides greater benefits to the participants. Finally, an Individual Staff Development Plan (ISDP) should be created for each employee to layout a path for development.

- *Technology Program Implementation Strategies*

A number of different strategies can be employed to meet the goals set forth for structuring and broadening technology development opportunities. The state of Rhode Island already offers a number of programs for teachers and principals through the University of Rhode Island RITTI program. This would alleviate some of the pressure placed on the school system since the programs are already established and offered through other institutions. This program has been successful statewide by engaging educators in focused technology competency development.

As the school system's WAN continues to become more robust, distance learning opportunities become increasing attractive. Particular users spread throughout the department would be able to take advantage of a particular offering that would otherwise not be attended due to time and distance limitations. As well, some users may be more likely to take advantage of this style of course if they are not as comfortable in a large group setting. As well, distance learning opportunities will increase the equitable access amongst users from a wide variety of schools within the school system. Currently the State of Rhode Island has initiated a robust distance learning program for its schools and should be used to a greater extent.

Expanding the technology coach program already in place is another vital step. As more pressure is placed upon the technology department, having qualified staff in each school that can manage and resolve minor technology issues will provide staff in those schools with a greater comfort level to utilize technology as part of their curriculum. A reasonable job description should be crafted that will outline the capabilities necessary to perform the tasks involved and give a baseline for other's to work towards to become part of the program. Instructional leaders at every level need to think of technology as an essential tool to support curriculum improvement priorities, not as an artificial add-on.

Technology-related staff development is still currently provided by various groups within the Department, but the efforts have not been coordinated together. A greater level of collaboration between the Curriculum Integration Specialist and Director of Instructional Technology would enhance coordination efforts in effectively integrating into curriculum and instruction. There should also be significant input from the technology department as to the skills they

view as necessary to function on an everyday basis in the school system. A clearly defined set of competencies should be put in place with the supporting development activities and courses to teach those skills. To insure continuity and eliminate unnecessary redundancy, PSD needs to determine the scope of staff development services that will be routinely provided at the department- and school-levels.

Further continuity and coordination can be promoted by adopting a staff development planning model and processes that promotes the alignment of staff development with Department priorities and mandates, and school improvement goals. The staff development planning model and processes should take into account how technology can be used as a tool to:

- Assess competency-based development needs and priorities,
- Market staff development opportunities,
- Research best practices and effective models of staff development,
- Engage in ongoing collaboration, communication, support, and technical assistance,
- Evaluate the effectiveness of development activities, i.e., the impact on practice using multiple assessment strategies,
- Schedule, track, analyze, and manage staff development activities and data, and
- Provide confidentiality and security of human resource data.

A number of schools have developed successful strategies and practices for school-based technology staff development, such as; collegial workshops, tutorials, peer modeling, coaching, mentoring, the development of student technology leaders, and distance learning options. These successful strategies should be explored to be used throughout the school system once they have been reviewed against the goals set forth by the department. A number of methods could be used to efficiently distribute these models including video based methods, personal instruction and online formats.

Commercial and private vendors are another source for developing technology competencies that can be cost-effective for such a large and diverse department. It is important to research outside vendors closely since their goals do not necessarily coincide with those of the school system. An extremely diverse offering exists and some can be tailored to specific requirements if a contractual agreement is entered by both sides.

It is critical that the central office clearly define the core competencies they desire to see in their staff. Once the competencies have been defined, they must be used to solidify:

- The school systems professional development program related to technology competencies, and
- Be used in job descriptions to insure candidates meet the anticipated level of performance.

Only at that point can professional development programs can be expanded or created that will teach the core competencies to their intended target groups. The programs will reflect the ideas that:

- Technology is a critical tool in the learning process of the 21st Century,

- Technology Skills are both individual and team focused,
- Learning is a lifelong pursuit, and
- Equitable access to technology is paramount to the school system.

As much as possible, the information and programs produced by the Providence School Department should be available electronically. Discussion has taken place within the department of expanding the REG 2000 Database to include more information and to make the information more widely available. As of this writing, the discussions were ongoing but no formal direction had been reached as to how best to expand that systems capabilities. However, the intent remains that information become as accessible as possible to all who desire access.

The course offerings should focus on the following:

- Providing a minimum level of competency
- Demonstrating the efficiencies of technology
- Infusing curriculum with technology-centered activities
- Incorporating technology into teaching methods
- Using technology tools in administrative and management activities

PSD teachers need additional training and/or ongoing support to improve student literacy and technology aptitude. To meet this and other critical needs it is essential that PSD expand technology-supported delivery options for staff development. Since there are viable models for on-line courses and development resources currently available, a good starting point is to identify these and provide school personnel with printed and/or on-line information on sources that could meet their technology competency development needs.

Since the school system is achieving its goal of implementing a robust WAN capable of supporting professional development activities, a renewed effort to develop and implement a process for updating information on on-line courses and resources should be undertaken. At the central office level, it is important to identify higher education, community, vendor, and corporate partners for developing and implementing distance learning delivery models that focus on staff development priorities in support of the desired strategic goals, such as improved student literacy and technology aptitude. Staff development activities available across the WAN should include:

- Online training and demonstration models,
- Online courses and programs,
- Distance Learning and Video Conferencing,
- Cable Television Broadcast and Distribution,
- Online Project-based Learning with Mentors, and
- Online Forums and Discussion Groups.

- *Staff Technology Competencies*

As referenced earlier in this document the Providence School Department is adhering to the ISTE's NETS for Teachers. Once the technology competencies have been determined and communicated, they can be incorporated into recruitment and hiring practices, job descriptions, staff development programs, and supervision and evaluation processes. An important resource for accomplishing this work is *NETS Standards for Teachers: Preparing Teachers to Use Technology, ISTE, 2002*.

Overall, the technology competency levels within the school system vary widely. This is true for staff at all levels and at school types throughout the department. As such it is imperative that unique standards are established for the following groups:

- Administrators,
- Principals,
- Instructional Staff,
- Media Specialists, and
- Support Staff.

Each position type should be defined further by individual job descriptions. These should include skills and competencies related to specific activities required as part of each job. For example, the Department has initiated a successful mentor program to help teachers redesign the curriculum to address literacy and technology skills improvement priorities. Mentors have been well-received, but technology is not routinely used by the mentors to support the literary and technology implementation ideas. It would be more beneficial to include a minimum level of technology competency associated with the job so that information could be passed to the student in this case.

While technology skills are critical to each level of user, perhaps the principals exercise the most influence in having technology integrated into the classroom. It is their leadership that influences instructional staff at an individual school and their usage sets the tone for technology being ubiquitous. In addition to providing development activities focused on technology competencies related to administrative and management functions and personal productivity, structured opportunities that enable principals and instructional leaders to improve the following leadership-related technology competencies also need to be provided:

- An understanding of, and the ability to build and communicate, a shared vision of technology integration as necessary to school improvement and essential to effectively addressing the department's curricular priorities and instructional mandates
- Coaching and oversight skills to assist teachers in the integration of technology into major role-related functions

The Chief Technology Officer has been participating in a program to work alongside principals to help guide decision making regarding technology usage at individual schools. This presence aids in giving the principals a comfort level that the instructional technology mandated will be supported from the central office level. As a relationship is forged and fluency of technology is developed the more likely principals will be insist upon technology integration into their institution.

One final critical element to requiring staff to meet the core levels of technology competencies will be to take a malleable approach that allows for current disparities in working with and integrating technology to be taken into account. It is not realistic to believe equitable access to technology and technology skills will be in place so a graduated approach should be considered. Performance-based criteria should allow for users and institutions to progress at a realistic and attainable pace given their histories and current circumstances.

- *Funding for Professional Development*

Funding for staff development has been understood by the Providence School Department to be critical to the successful implementation of technology throughout the school system. To date the Department has primarily funded staff development. Most of the training has been offered during department provided in-service time or after school hours.

Ongoing department curriculum funds are used for staff development, both to cover substitute expenses and to pay teacher trainers. Federal Title I and Title II funds have been used to fund curriculum development, training of trainers, technology assessments, and design of staff development courses. Most of the Providence School Department principals have participated in the training activities funded through a Wallace Grant with the purpose of that grant being to turn principals into instructional leaders. The school system is working towards the Whole School Effectiveness model and has based their programs on the Institute for Learning from the University of Pittsburg. The Providence School Department has also used dollars from the Gates Foundation fund ongoing staff development in schools, as well as providing funds for equipment and training of teachers

One of the greatest hurdles has been uneven funding of programs. A feeling of uncertainty was expressed from multiple sources within the school system that they were hesitant to start down the road for fear that funding sources would shrink or dry up completely. To overcome this issue as well as other funding issues, the Providence School Department should:

- ❑ Seek to evenly fund programs through more focused long-range planning,
- ❑ Expand upon capabilities within the school system of finding and tapping into funding streams for professional development,
- ❑ Build relationships with vendors and partners outside of the school system who can provide technology related training, and
- ❑ Participate more heavily in programs established by the State of Rhode Island that are offered free to the school system and its employees.

2.5 Student Initiatives

The learning environment put forth in the new Teaching and Learning Model (T&L Model) of the central premise places significant responsible on students for their learning. To be successful this change will require students to not only acquire technology skills but also to develop personal and social skills to fit the new environment. In many cases these student skills will have to be taught and developed.

The new T & L model motivates students to become active participates in a collaboration, project based, small group learning environment. Technology will support teachers and students in a desired student learning environment which is learner centered, project based, active, multi-sensory, and which contains individualized/small group instruction. A major goal of this learning environment is that students will acquire critical thinking, problem solving, information analysis, team building, and life long learning skills.

- *Goal*

Goal 7: Create an environment and provide resources that will allow all students to equitably obtain access to and use the technological and social skills required to thrive in the new T&L model and function successfully in the twenty-first century." Also refer to the sub-goals listed for Goal 7 in the Action Plan of Chapter 5.

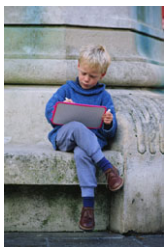
The student initiative goal has several aspects dealing with students:

- ❑ Student technology skills
- ❑ Student personal skills to be successful within new T & L model
- ❑ Equitable access to technology
- ❑ Technology applicable to special needs students

- *Student Technology Skills*

Concerning the first aspect, department-wide student technology standards need to be articulated or embraced for grades K-12. Although some Providence staff is knowledgeable about the International Society for Technology in Education (ISTE) National Education, technology standards for students have yet to be identified and aligned with appropriate core curricular PSD areas. The Departments needs to appoint a committee to review, modify, and approve the ISTE standards provided by CELT and reproduced in Appendix A. These standards are divided into six broad categories:

- ❑ Basic operations and concepts
- ❑ Social, ethical , and human issues
- ❑ Technology productivity tools
- ❑ Technology communications tools
- ❑ Technology research tools
- ❑ Technology problem-solving and decision-making tools



PSD should consider the design and implementation of a web-based relational database to accommodate the K-12 aligned student technology skills that address specific content area standards. Details could be provided on what effective use of technology skills integrated with content standards looks like in the classroom. This database should be expanded over time and become highly accessible and searchable by teachers at all levels and in all disciplines as a reference for implementing the technology standards with academic learning standards. The Department might consider the selection of core

technology standards as a graduation requirement, once sufficient resources are in place to ensure equity of access for all students. For full accountability on this area, the Department should establish appropriate benchmarks, performance measures, strategies for remediation, a central tracking system, and effective communication channels to achieve accountability in implementing the core technology standard requirements.

It is important to the Department that the student technology standards be fully aligned and integrated with content standards in various disciplines and not be taught as a separate skill area or discipline. Strategies for integration should supersede efforts to teach technology standards in isolation.

- *Student personal skills*

Research should be conducted prior to the establishment of the three demonstration schools that would identify and quantify the student problem solving, social, and student personal communications skills necessary to thrive in the new the technology supported Teaching and Learning Model. A task force should review the results of the findings and develop skill development curriculum packages which address the criteria students need to be successful in this environment.

- *Equitable access to technology*

The Department is committed to providing all students equal access to the technology resources necessary for their successful participation in the new Teaching and Learning Model. Access refers to the students' ability to use instructional technologies to enhance/support learning about and with technology. Access is linked to several important variables:

- ❑ The number of computers (generally evaluated in terms of a student-to-computer ratio)
- ❑ Availability of instructional software,
- ❑ The location, configuration, and scheduling of technology resources
- ❑ The use of networking and/or telecommunications to transcend classroom and school geographical boundaries
- ❑ The proficiency of teachers and administrators who can support and guide instruction
- ❑ Acquisition approaches and decision-making processes by which schools acquire instructional technology resources.

The efficient acquisition and management of technology resources will help ensure that:

- ❑ Schools are provided with equipment that meets or exceeds department standards
- ❑ All students have access to current, appropriate, and sufficient information resources

- Existing resources are used to their maximum potential so that future dollars are spent in areas of greatest need

- All schools attain a sufficient infusion of instructional technologies to attain department goals through local implementation solutions

Existing technology should be replaced or upgraded when it no longer enhances the teaching and learning processes in classrooms or labs. The deployment of assistive/adaptive devices for special needs populations must be included based on the populations serviced by the school.

PSD should research and disseminate via the department website successful strategies, programs, and models for addressing the needs of students at-risk from pre-K through grade 12 by:

- Determining criteria for selecting at-risk populations that can benefit from technology enhanced interventions;

- Aligning technology enhanced interventions, including hardware and software models, with at-risk populations;

- Creating and disseminating assessment strategies to align individual students at-risk with the most appropriate interventions.

- *Instructional Applications*

Although the Department has made significant strides to provide standard sets of instructional software to all schools, there is great variance in software used across the department. At the Department level, Providence has standardized on a core of applications beyond the productivity suite that can be supported with professional development offerings and on-going integration/ implementation assistance. The software content of this core set of applications should continue to expand. Standard applications should include age appropriate website design, multimedia presentation, desktop publishing, and thought generation/brainstorming applications.

Teams of teachers and curriculum leaders with experience in technology integration should identify and select developmentally appropriate applications for grades preK-12 that align with Department curriculum guides while supporting and enhancing the current productivity suite. Providence should coordinate vendor demonstrations of instructional technology applications at convenient sites throughout the Department. Featured software applications should be demonstrated to a wide audience of Providence teachers. The Central Office should develop dissemination strategies for making teachers aware of these resources and their intended use. Also, the Department should ensure that high volume purchasing agreements or licenses for these core applications are negotiated annually, as needed.

- *Internet Access*

The power and potential of the World Wide Web and its vast collection of educational resources has become increasingly more available in school classrooms. Expanded telecommunication capacity and Internet connectivity allows most teachers and students to have access to and benefit from this global network of information. PSD should continue to identify strategies that take advantage of the Internet access throughout the department as robust school and classroom connections increase. These strategies include:

- Providing professional development and technology resources to enable faculty opportunities for experimentation with and exploration of the Internet,
- Determining appropriate instructional resources that can be made available for after-hours student access and for community access via the Internet, and
- Developing web-based strategies for community information access and dissemination.
- Communications department-wide can be enhanced greatly through the effective use of e-mail. Providence should continue to expand the use of e-mail to all staff and students who could benefit from it educationally. To support broad e-mail use, Providence should continue with the efforts to expand bandwidth to schools to enable increased e-mail traffic at higher speed

- *Technology applicable to special needs students*

Efforts must be made to focus major curriculum and technology integration initiatives on specifically identified Department student priorities such as:

- Bilingual education,
- Special education assistive technology, and
- Students at risk.

2.6 Curriculum and Assessment

The Curriculum and Assessment section addresses the issues necessary for the long term evolution from state/department curriculum guides to on-line computer based learning modules, from periodic standardized and interim assessments to real-time criteria based continuous learning management. The learning environment put forth in the new Teaching and Learning Model (T&L Model) of the central premise places a significant requirement on the development and implementation of easily accessible on-line learning management decision systems. The intend of this section is to plan the progression from current systems to enhanced periodic classroom assessment systems using improved technology to comprehensive learning management systems to be implemented in the demonstration schools.

There is a need for a systemic, technology-supported approach to student assessment and evaluation. In light of assessment requirements of the “No Child Left Behind” Act, departments soon must track and compile student assessment data in reading and mathematics on an annual basis. Hopefully, such an assessment approach will provide teachers with timely and ready access to assessment information on individual students to the extent that such data can be used in the immediate design and adaptation of instructional activities.

- *Goals*

Goal 8: Implement a technology based classroom assessment and instructional management system that will allow teachers to become efficient managers of every students' learning plan.

Goal 9: Develop and/or obtain a web based integrated curriculum and learning system that links curricular, assessment and instructional resources.

The implementation of these two goals should be accomplished in two parts.

- *Assessment Implementation – Part One*

First, efforts should be made to continue to expand the classroom utilization of the assessment data available from the existing REG 2000 system. An additional component of the system, interim assessment data to teachers, is planned for pilot implementation in the fall of 2006.

PSD has implemented a Department-wide student assessment system that:

- ❑ Addresses multiple indicators (i.e., the SAT-9, RIEP, and authentic classroom-embedded assessment measures);
- ❑ Correlates all forms of student assessment with the content standards, benchmarks, and performance standards;
- ❑ Links directly to curriculum development and learning management information;
- ❑ Provides electronic, easy-to-access information;
- ❑ Creates assessments that determine student proficiency with technology in the context of the integrated curriculum;
- ❑ Includes ability to aggregate and disaggregate assessment data by multiple student characteristics;
- ❑ Provides on-line assessments that are timely and easily implemented in critical development areas and levels;
- ❑ Meets the needs of all students.

Future enhancements to the existing system that should be implemented for all schools might include:

- ❑ On-line test administration,
- ❑ On-line analysis capabilities for teachers,
- ❑ Test item bank for computer test generation, and
- ❑ Consolidation of data bases to be able to analysis individual test data with other student data.

The intent of these improvements is to increase the use of student data for learning management by teachers and be a prelude to a more comprehensive future instructional management system.

- *Assessment Implementation – Part Two*

The second part of the assessment implementation should focus on the more comprehensive student achievement data needs of the new Teaching and Learning Model that will be required for teachers learning management.

Technology can enhance the success of all PSD programs and play an instrumental role in meeting their goals. It can support important activities, such as implementing a program's evaluation and student monitoring system. A critical area of need for technology integration in programs is in the support of product indicators including tracking at-risk variables, student achievement, discipline records, attendance rate, and graduation rates for students' participation in specific PSD programs. Technology can also provide timely information regarding the numbers and types of students involved in a program's learning experiences, as well as teachers trained in different aspects of a program's support system.

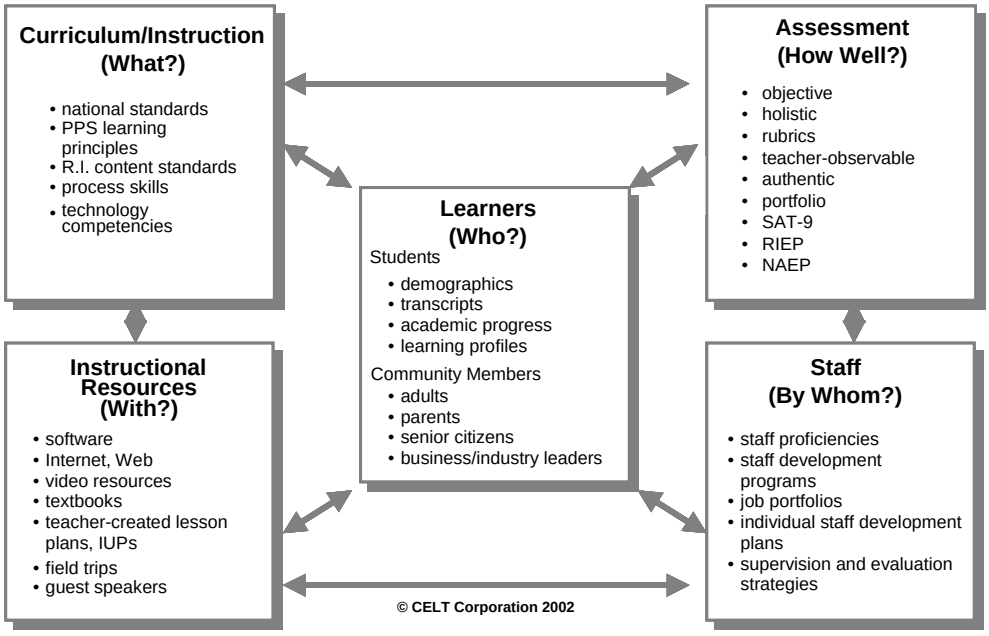
As part of the decision support system building process, the major critical information needs for staff in various PSD programs should be identified and prioritized. Identification and selection of a set of data for use by staff should occur, but this must be accomplished within the framework of a comprehensive student database. To ensure success, program staff must also have easy and daily access to hardware, software, technical training, and support. The data set should be carefully selected to align with the requirements of the “No Child Left Behind” Act. Implementation, monitoring and evaluation systems should be established to ensure quality, coordination, and goal achievement.

- *Curriculum Development/Learning Management*

A curriculum development/learning management (CDLM) software system is required to support the new Teaching and Learning Model proposed in the central premise of the Technology Plan. Such a system would link curriculum with student information, instructional resources, and assessment strategies, can facilitate the orderly flow of large quantities of integrated information that has an impact on teaching, learning, educational management, and decision making at all levels. PSD educators can use a CDLM application as part of a department Decision Support System (DSS) to articulate and catalog learning goals (e.g., content and performance standards and benchmarks, etc.) and cross-cutting competencies as they relate to selected curricula. Once standards, benchmarks, and competencies have been electronically catalogued, a CDLM approach would allow for the detailing of learning resources as they support teaching processes, and of strategies that will lead to student achievement of each benchmark.

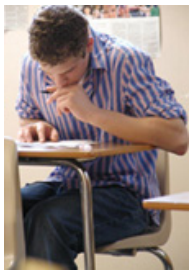
As illustrated in the figure below, multimedia, software, books, etc., can be correlated to specific learning goals with a comprehensive description as to the use of such materials. Teachers can document, record, and electronically share units and lessons that have been successful in achieving desired student performances. The correlation of performance to instructional resources will shift the emphasis away from a curriculum dictated by the textbook to one encouraging inquiry and the development of lifelong learning skills (constructivism). The textbook now becomes only one of

many resources available to assist PSD teachers in reaching the student educational goals reflected in the CDLM approach.



- *Technology in Support of Curriculum Development and Learning Management*

With CDLM technology in place, student assessment can be correlated to performance measures. CDLM software can record the PSD' multiple assessment indicators and link them to the Rhode Island Curriculum Framework standards and benchmarks (i.e., Rhode Island State Assessment [RIEP] in Language Arts and Mathematics, National Assessment of Educational Progress [NAEP], Rhode Island Writing Assessment). A CDLM system will also enable educators to create banks of test items and catalog other evaluation methodologies (e.g., holistic scoring, teacher observable assessment, portfolio/authentic assessment, etc.) against desired student performances. Assessment reports generated by CDLM software are varied, offering detailed information to parents, teachers, and students, and can assist the Department in establishing Department-wide report card standards while offering local departments and schools the flexibility to customize certain reporting components.



Using CDLM technology, educators and parents will be provided with comprehensive profiles of student performance against designated performances for the duration of a student's enrollment in the Department. A rich variety of information made available to teachers, administrators, and parents through CDLM will enable them to determine which learning methods, resources, and student assessment measures are contributing most to student attainment of State content standards and benchmarks.

PSD should consider development of a decision support system to meet a variety of administrative and instructional needs. Strategies may be identified for providing teachers with current student information to help inform timely decision-making. Reports and queries may be developed that integrate with the Departments' REG 2000

Student Information System to provide teachers with a timely analysis of useful current information to help guide instruction.

The Department should integrate into the proposed decision support system a curriculum development and learning management component that will:

- Be easily accessible to teachers and administrators at the classroom, school, local department, and Department levels
- Use a relational database architecture
- Link curricular information (e.g., content standards, performance standards, etc.) with learning resources, student assessment, and student information
- Monitor the alignment of instructional resources to Department standards
- Enable educators to record and share the alignment of content standards,
- Benchmarks, performance standards, frameworks, and cross discipline competencies

Steps for acquiring and implementing a curriculum development/ learning management system would include:

- Clearly defining for administrators and educators the intent and purpose of the system for improving instruction,
- Developing functional and bid specifications for a CDLM component in accordance with identified Department needs and with full compatibility with other applications (REG 2000, human resources, etc.) in the decision support system,
- Procuring, implementing, and testing the curriculum development/learning management system in a pilot setting,
- Implementing the curriculum development/ learning management system across the Department, and
- Providing training and support for maximum utilization of the CDLM system.

Curriculum and technology will play an unquestionably crucial role in the futures of PSD children. Experts from many disciplines echo the sentiments that technology should and can play an important role in curriculum planning, development, delivery, assessment, and administration in fostering student academic excellence.

2.7 Community Involvement

The success of any educational system is dependent upon the degree to which the community-at-large supports that system. The magnitude of the three components of the Technology Plan makes positive support from parents and community even more vital.

- *Goal*

Goal 10: Engage parents and community in the planning, design and operation of the learning environment defined by the central premise."

The new Teaching and Learning Model put forth in the Technology Plan will require significant involvement of parents and community in the planning of the three demonstration schools. It is anticipated that parents and community representatives should be involved in the focus group meetings for planning and design of these new school environments.

Technology can provide better opportunities for parents, the business community, and higher education to see their schools' work-in-progress, and to view and study the information that they will use to hold the system accountable for results. Listening to what the community wants and expects from its schools and its children, and developing accountability tools to help the public assess the department's performance are keystones to any public engagement effort.

The Providence School Department has a major goal of parental involvement at every level in the schools. This goal naturally includes leveraging services and support for technology-based community learning. Incorporating technology-based community learning programs into a school's repertoire of services and programs will better facilitate school and community linkages, and improve communication with the public. The expansion of partnerships among the PSD, the business community, and higher education can build human and material resources that contribute to the attainment of educational goals.

- *Home/School Connections*

As stated in the Superintendent's framework for reforming Providence Schools, *Whole School Effectiveness*, the Department, has made it a priority goal to strengthen parent and public engagement. Home/school communications are implemented mainly through print media, either as newsletters or newspaper announcements. A Department website is available. It is reasonably robust, bilingual, and is an organized source for School Department information. Some, but not all, schools have websites.

There is a strong interest in identifying effective ways to establish communications between school staff and parents. In general websites are of limited value as a communications media for parents because many families do not have a computer at home.

Critical staff to connect school with home includes nurses, counselors, psychologists, speech-language-hearing therapists, occupational and physical therapists, and other support staff who may actually serve several schools. Information must be made available to these staff members on a timely and daily basis. The capability of sharing data and information with health and service organizations, courts, and city and state agencies is a crucial component in the development of a responsive network infrastructure. However, identification, selection, and prioritization of that data and information must be accomplished within the framework of a comprehensive student database. To accomplish these goals, staff must have easy and daily access to hardware, software, training, and technical support.

To achieve department goals, technology needs to assist schools in helping students and their families secure the services from health and social service agencies. Technology should support the establishment and follow-up of these health and social service agency linkages, and provide each school with the capacity to build on existing family support and education programs. Technology will also play a critical role in providing ongoing up-to-date information and referral within the school community, and in reporting unmet needs, services used, and results achieved. Facilitating these partnerships could put an end to the isolation of many of the schools that do not currently have easy access to these services.

Technology will also play a major role in school safety by providing to appropriate users an overview of offenses and approved corrective action, and improving cooperation and understanding among students, teachers, nurses, and community liaisons. It will also facilitate follow-up with families in the community and home visits. Additionally, new data collection strategies will assist security personnel in predicting potential problems as well as in providing performance indicators.

Ongoing communication between school and the community or home needs to be nurtured through a variety of technology-based activities and processes. These activities and processes will enhance school-community relations and, at the same time, develop support for the use of technology in the schools. These technology-supported activities and processes could include the following initiatives:

- ❑ Introduce a school voice-mail systems to provide additional opportunities for communication between home and school. Ideally, homework assignments and calendar events could be posted in a central announcements mailbox. These systems will also allow parents to leave messages for individual teachers.

- ❑ Assign the function and responsibility for the development and maintenance of Web sites for schools and programs. Provide ongoing technical assistance in maintaining school Web sites.

- ❑ Increase access to hardware, software, the Internet, and training to address and facilitate parent and community needs, partnerships, and linkages with city and state agencies.

- *Community Learning Programs*

The outcomes of sharing with the community the Department's educational, business, and technology resources will prove to be an enormous benefit to all involved. Access to schools' technology resources in the form of community learning programs will increase technology literacy within the greater community as well as provide greater cost effectiveness of schools' technology expenditures. To this end, an organizational unit for community education, separate from adult education, should be created to seek ways to increase the number of technology-based, community-learning programs available to the public.

Most importantly, the availability of technology in schools, after school hours, can be utilized to improved literacy skills among the adult population. Many instructional software resources are available, designed specifically for adults that can improve reading, writing, listening, and communication skills. The Community Education unit would include as major functions:

- ❑ Identification of appropriate technology resources in schools,

- Acquisition and licensing of software that research indicates to be effective for improving adult literacy,
- Development of program funding sources,
- Collaboration with and among adult literacy providers, and
- Staffing and security for programs.

A committee of staff and parent representatives from schools with model technology community-learning programs could help support other schools in developing a parent volunteer program. Parents with technology skills and those who are willing to be trained can be recruited to volunteer in computer labs, libraries or in classrooms. These volunteers will also be able to upgrade their technology skills as they coach participants. It will be important to develop a set of department-wide guidelines or policies for community-learning programs to facilitate access and insure security for technology facilities after school and during the summer. Community-learning programs should also draw upon the experiences and expertise of exemplary national, regional, and local technology-based programs. Schools will need department guidance, resources, training and technical support in designing and implementing technology-based community learning programs.

Technology-based community-learning programs provide the opportunity to develop and sustain community-wide support for technology while at the same time increasing parent, family, and community technology literacy. As schools pursue joint organizational relationships, there will be opportunities for schools to be open during off-hours. This time could be used for jointly agreed-upon adult education classes and programs aimed at promoting the technological fluency of parents. Such classes might include weekend programs, summer programs, courses for credit, and enrichment programs. School Improvement Councils could also provide input to a department-wide public information plan.

There are pockets of success such as the Volunteers in Providence Schools (VIPS) cyber-café that provide greater access to computers for both students and parents. Instructional technology resources are typically not available to community members beyond the school day. Reasons include: (a) resources for security and supervision, (b) equipment not centralized, and (c) appropriate instructional applications not identified and available. Custodial costs also make parent and community use of facilities and technology resources a financial matter. However, there is ongoing interest at all levels for more school-community linkages.

Efforts to promote collaboration between schools and outside agencies are compromised by very limited technology resources. A need for improved family outreach to support early intervention programs has been identified. Some school leaders would like to see their schools become community resource centers and are building partnerships with groups and expanding opportunities for student and community access throughout the year. There is minimal coordination and publicizing of existing community learning programs, partnerships, and relationships.

Teachers estimate that less than 50% of the Department's student population has access to a home computer or regular Internet access beyond the school day. No formal survey has been conducted to validate this finding. Ad hoc queries of students during site visits indicate that home computer availability may be higher than teachers perceive.

- *Public Information and Awareness*

The Student Registration Center has a six-year implementation plan to improve the registration process for parents and students. The changes in the process were lauded by a number of administrators.

The PSD have goals related to student achievement, school safety, and family/community involvement. Yet, there is no clearly identified function for attending to the needs of at-risk students and families through collaborations among the schools, service organizations, and support agencies. There is a need for communicating to the public, business community, and higher education the expectations and potential benefits of technology initiatives.

A department public information and awareness plan is needed to garner support of the *Technology Plan*. The purpose of the plan will be to assist parents and community leaders in better understanding how technology can be used in the schools. In addition, strategies will be developed to create opportunities for ongoing communication with the members of the community regarding school technology issues.

Technology should be used as a tool for implementing the plan. To support these efforts databases will be needed to allow the department to collect and analyze survey data so that staff can better understand the needs of the schools' constituents. Communication technology enables the schools to reach more people more often. Through new accountability tools that use technology, schools can ensure that the public is aware of the department's performance and has the information to hold the schools accountable.

The Department needs to continue building its Web presence so that parents and community members can increasingly retrieve information about the PSD. Eventually, parents will be able to view their children's progress and then communicate directly with teachers from either their home, local library, and/or community center/organization. Communication with the public means reaching out to many different audiences. The diversity of socio-economic groups and languages makes it imperative to create a number of mechanisms to ensure that all groups are reached. A public awareness campaign should include multiple outreach strategies, such as:

- ❑ Use of various media to disseminate the vision and goals articulated in the *Technology Plan* to homes, businesses, community agencies, and higher education institutions.
- ❑ Support of the Mayor's Office and Municipal Council members to act as advocates for the Technology Plan.
- ❑ Citywide and local public forums for community, business, community agencies, and higher education leaders to garner support for the vision, goals, and implementation strategies of the *Technology Plan*.

2.8 Technical Support

The purpose of this section is to describe the technical support resources necessary for the planned multi-year implementation of:

- Expanded communications infrastructure planned for all schools,
- Demonstration classrooms in all schools,
- Three demonstration schools, and
- New and modernized schools.

It is of the highest importance that expanded technical personnel resources and training be provided to support the implementation of the new Teaching and Learning Model and the increased classroom technology equipment it requires.

- *Goals*

Goal 11: **"**Provide resources necessary for a plan to provide the technology staffing support necessary to implement the technology based Teaching and Learning Model put forth in the central premise."

- *Current Technical Support*

Currently the Chief Technology Officer and technology department are understaffed to accomplish all the tasks required on a daily basis. Considerable time is consumed by "putting out fires" and trying to maintain the current situation. Therefore, they have not been able to focus on where the department is heading with technology as much as they would like. Schools have a diversity of computer, network hardware and software making troubleshooting an unnecessary challenge for an overwhelmed technology department. This results in under utilization of classroom technology. A greater level of equipment and system standardization would alleviate a large portion of the strain on the technology staff. Administrators and teachers are currently under-trained on the present Information Technology (IT) devices in schools. Current IT training programs for administration and faculty are non-existent or insufficient. There is no current plan for training on new technology and how it can be used in the classroom environment. Training of faculty on basic computer and IT devices is critical to an efficient technology support staff. A more technically knowledgeable faculty would allow the Technical Support staff to focus its time and resources on keeping the network running, and issues that need immediate attention. Additionally, providing certain key staff with the proper set of skills to manage and resolve minor technology issues at the school level will greatly reduce the time spent by technology staff assessing and addressing issues across the department.

There are no student involvement programs in place that could help with technical support on a, school by school bases. An elective or computer lab class that would put students in real life network administration situations would be a great asset to both the students and schools. The central location in most schools for Information Technology is typically the Media-Center. This area acts as the hub for information technology and IT devices. The media-specialist must be knowledgeable in the IT equipment within the facility and they must have a good understanding of computer usage, computer applications and other peripheral devices.

- *Technical Support Staff for Tomorrows Schools*

Identifying department-wide technology competencies and performance levels for staff is the first step in improving technology-related staff development. It is recommended that PSD adopt ISTE's National Educational Technology Standards for Administrators and Teachers as referenced earlier in the documents. Once the technology competencies have been determined, they can begin to be incorporated into recruitment and hiring practices, job descriptions, staff development programs, and supervision and evaluation processes.

Staff

The schools principal must understand the benefits that IT offers to not only to the students, but also the staff. Technology leadership by the principals is critical if technology is to be integrated into schools. PSD needs to set expectations that principals and other administrators will model technology integration in their daily functions and communicate to staff and parents how technology can help their schools address high priority school improvement needs and department mandates. This means on-going training programs for teachers as well as the support staff. The least desirable activity for Tech Support staff is taking help desk calls for minor computer and peripheral issues. If the staff is trained in usage of the resources made available to them, then the Tech Support staff can better maintain the network and urgent issues that arise.

- *Student Technology Program*

A largely untapped resource inside the school system is the student population. In many cases, students can do basic to moderate level computer trouble shooting. Students already provide help with simple troubleshooting and routine maintenance tasks in many schools successfully. This can become a more formalized, supervised and recognized position in the PSD. Student technology programs are a great way to supplement the immediate need for IT technicians. This can be lead by a member of the technology support staff.

After school technology clubs are also beneficial. Students, who have A+ Certification and have participated in the networking courses, can help with peer to peer instruction within the IT classrooms and after school clubs. This setup provides a "real life" application for the student's training.

Media Center

Some schools have library media staff members with extensive knowledge and skill in supporting teachers' technology integration efforts. This level of expertise should be a standard to which the PSD sets for its librarians. It is important to establish department-wide library-media technology competencies that are aligned with guidelines of the American Association of School Librarians. Skilled library-media specialists can be important members of the school-based leadership teams.

Technical Support

For a Technical Support staff to be effective, direction must start from the PSD. There must be a department-wide standard established on all hardware and software that will be supported by the Technical Support staff. These new standards are to be distributed to school administrators as guidelines for purchasing, training and support.

The Support Technicians should receive enhanced training in network administration such as:

- ❑ Network Devices (Switches and Routers)

- Cisco
- Nortel
- Any Department specific equipment

❑ Software

- Windows operating systems
- Email software
- Firewall software
- Any Department specific equipment

❑ Server administration

- Web server
- Email server
- DNS Server

Continuous training shall be provided for all tech support staff. This will ensure that all tech support staff has the ability to maintain the schools network as technology changes.

It will be essential that the Technology Department be expanded over time to respond to the growing support needs of users. In planning for future support needs it is helpful to consider functions within four service domains. Examples of functions for each service domain are provided below:

❑ Learning Resources and Instructional Technology

- Library-Media management and services
- Online circulation and delivery
- Instruction and technology integration
- Instructional applications
- TV and multimedia
- Distance learning and video conferencing

❑ Communications and Network Infrastructure

- Business and financial systems
- Student information system
- Information processing tools/standards
- Relational database management
- Document storage and retrieval

❑ Information Management

- Network management
- Voice/video/data infrastructure
- Internet access and security
- Electronic communication (e-mail, fax, etc.)
- Phone system
- Department website management

❑ Operations and Maintenance

- Hardware and software maintenance
- Technical standards and procurement
- Installation and contract management
- Fixed asset/capital asset management
- Electronic project management
- End-user relations and management
- Research and planning

In each of the four service domains there is related staff development for users, technology support staff, and related Help Desk services. Clear guidelines and standards of service for department-provided, school-based, and outsourced technology support need to be established.

Appropriate staffing is necessary for ensuring that the equipment is reliable. The staff and students must have the ability to use the equipment with as little interruption as possible. Some technology functions may be staffed on a one-time basis or can be filled by outside contracts while other functions clearly require full-time, ongoing position as part of the school system staff. As this plan is implemented, it is perceived that the Providence School Department will have requirements for the following positions:

- ❑ Chief Technology Officer
- ❑ Central Office Technology
  - Network Manager / City Hall Coordinator
  - Central Office Technology Support and Consultants
  - Internal Professional Development
- ❑ REG 2000 Team
- ❑ Decision Support System (DSS) Team
- ❑ Educational Technology
  - Coordinator Technical Services
  - Technical Services Expediter
  - Computer Management Specialist
  - Help Desk and PC Technicians
  - Other Contracted Services for Repair
- ❑ Instructional Technology
  - Director of Instructional Technology
  - Technology Integration Mentors
  - Professional Development Providers
  - Monitoring and Evaluation
- ❑ Technology Coordinators

- *Organizational Development*

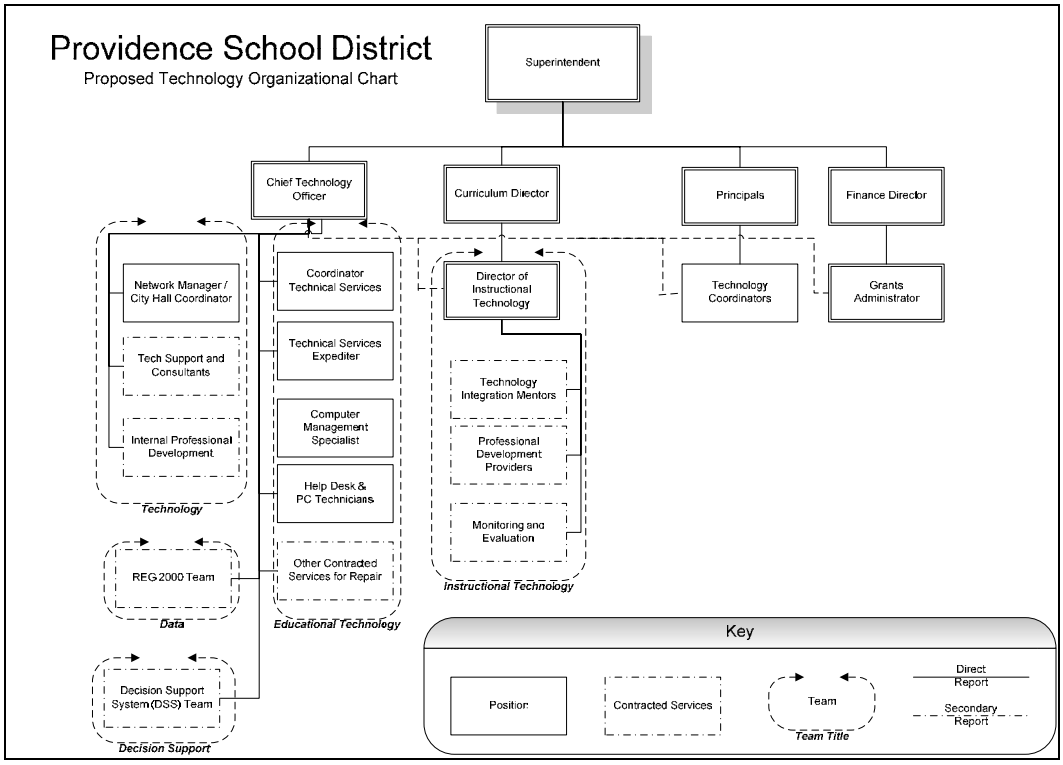
As the ideas and programs mentioned above are implemented, it will become increasingly important that the central office maintain a plan to support a higher level of technology integration instructionally and administratively. The Technology

Department will be called upon to manage a more complex and distributed set of technology tools, equipment and ideas. Since the school system is committed to implementing a curriculum that produces students with the skill set necessary to succeed in the 21st century job market it must insure that a framework is in place to can integrate technology in a seamless manner. The school system must be ready to provide support for:

- Instructional Technologies,
- Technology and Communications Infrastructure,
- Information and Application Management,
- Technology System Operations and Maintenance, and
- Technology Upgrade and Migration Cycles.

These 5 areas of needed support require involvement from many levels within the school system. The following organization chart highlights who must be involved and the flow of information critical to accomplishing the implementation strategies

An organizational chart for these human resources follows:



To guide the recruitment and ongoing training of department and school-based technology support staff, the previously mentioned competency-based job descriptions should be developed. The Sample Job Responsibilities in Appendix B can be a useful resource for this task. After the major functions of department and school technology staff are clarified, technology competencies can be identified that align with these functions.

2.9 Administrative Applications

Providence School Department is well under way in demonstrating the advantages of technology applications for administrative uses. Automated data collection, reporting features and database functionality help to increase efficiency and reduce the delay in that traditional systems create. Developing further applications and increasing the reach of the systems currently in place will greatly enhance the Teaching and Learning Model envisioned for Providence School Department.

The dual purpose of increased application of technology to administrative functions is to:

- Provide greater support to classroom instruction throughout the department and the new Teaching and Learning Model, and
- To increase the efficiency of business operations.

- *Goal*

Goal 13: **"**Utilize technology to transform business applications"

An additional purpose in the technology utilization described throughout this Plan is to foster and improve communications amongst the Providence School Department. As described earlier in this chapter, and in greater detail in Chapter 4, infrastructure must be put in place to allow quicker and better communications between the elements of the Department. The tools that then operate along this infrastructure provide the efficiencies and benefits of technology. If these tools do not grow and evolve as technology will allow, then the infrastructure is not worthwhile.

- *Student Information Management System (REG 2000)*

The Providence School Department relies entirely on a custom student information system, REG 2000 (REG), for managing its student data. An outsourced company, Firm Solutions, developed REG 2000. Firm Solutions maintains REG 2000 and is currently upgrading the product. There are over 300 users of REG 2000, including the attendance clerk in each school as well as some guidance counselors. Although REG 2000 is not yet directly available to the teaching staff, a pilot implementation allowing teachers access to interim student testing data is scheduled for fall 2006. A major restriction for access to REG 2000 is the limited number of workstations that have access to the application since it runs over a dedicated ISDN network that is only connected to administrative offices. Principals, guidance counselors, and administrators are seeking simpler, user-friendly query tools to access and interpret important data from REG 2000. Department leadership has expressed the need for planning and decision making to be more research and data driven. REG 2000 has a valuable, long-term store of student data.

REG 2000 was originally developed for tracking student records and attendance. Ongoing training must be provided as soon as possible to building administrators, appropriate system support staff, counselors, and all other end-users. Training approaches need to be designed to fully meet user needs rather than be a single event within a pre-determined time span. As the application becomes more widely available, training should also be scheduled onsite at the school buildings. Guidance counselors in particular need to be fully competent in appropriate modules of the system and receive subsequent high-level access to the scheduling system and its features for

reviewing and modifying individual student schedules. Ongoing user groups' meetings should be pre-scheduled throughout the year to deal with emerging issues or to refresh on seasonal student information activities. Since the department is committed to using the REG 2000 system which will be vital to the successful implementation of a decision support system, the department needs to budget appropriately for the upgrades, maintenance, training, and access for all the staff

New modules such as transportation, scheduling, health records, test history, discipline and special education tracking have been added.

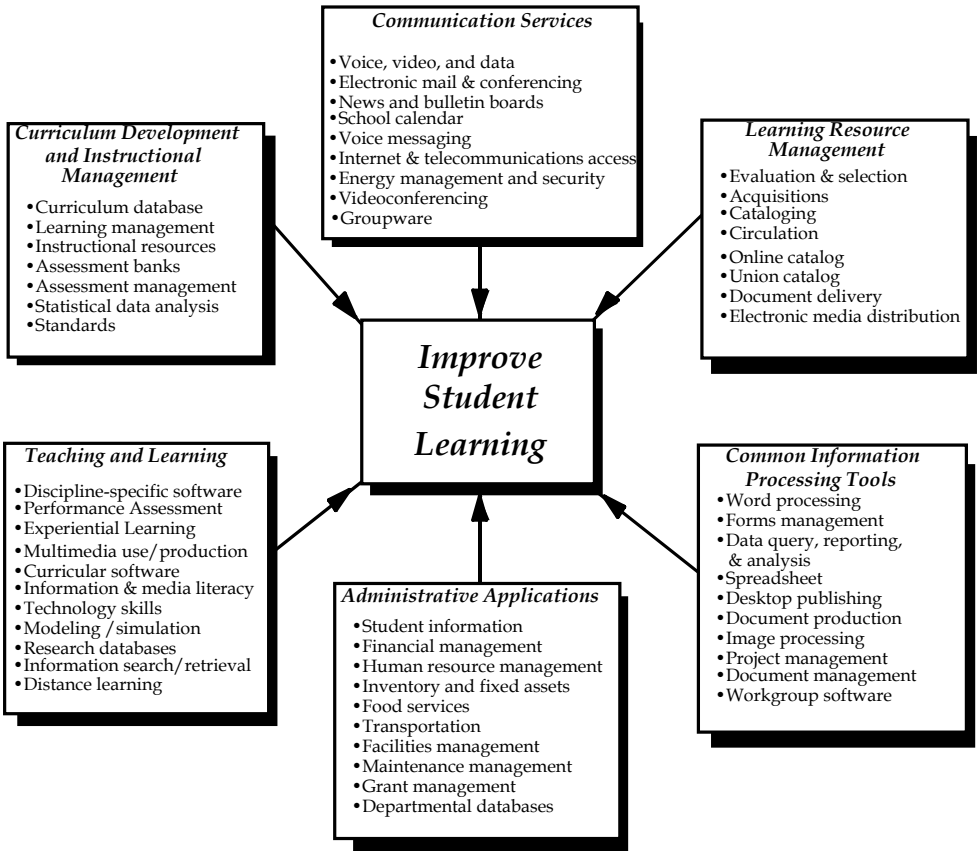
- *Student Transcripts (Connect!)*

Connect! provides students, counselors and parents with individual process management tools for completion of their individual college planning tasks as well as linking them into a collaborative on-line community for resource and information sharing. For students, Connect! offers an interactive environment allowing them to collaborate with their counselor, teachers, parents and colleges in a secure, on-line environment. Students are provided with interactive college search and comparison tools to evaluate and interact with colleges based on their academic, environmental and financial needs or interests. Students also use Connect! to complete and track process related steps such as submitting transcripts and letters of recommendation to colleges as well as completing federal financial aid and scholarship forms for submittal to the federal government.

- *Information Management*

The Providence School Department (PSD) should consider establishment of an technology architecture that ties all administrative and instructional applications (see Figure 6-1) together in an integrated multi-vendor environment. This integrated environment would extend from the classroom workstation to the central office and beyond. On the teacher's workstation, it would provide the tools to create, access, analyze, present, and report information. On the server, it would include the systems to secure, manage, store, and distribute information. Effective distributed computing requires standardized interfaces and connectivity, allowing complete integration of information from multiple sources on multiple hardware and operating system platforms. It also facilitates high productivity and easy-to-use tools for users, developers, and systems managers.

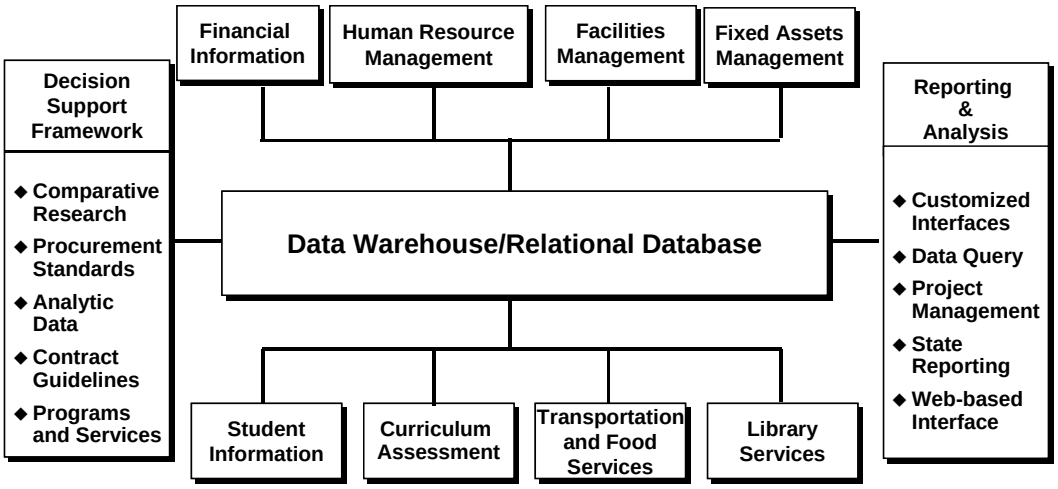
The decision support system must fit into PSD' overall application framework to improve access to information allowing the user to do what is expected of him/her. The framework encourages use of Web-based interfaces to applications where it makes sense and creates department-wide repositories that can be used by multiple applications and all users.



- *Decision Support*

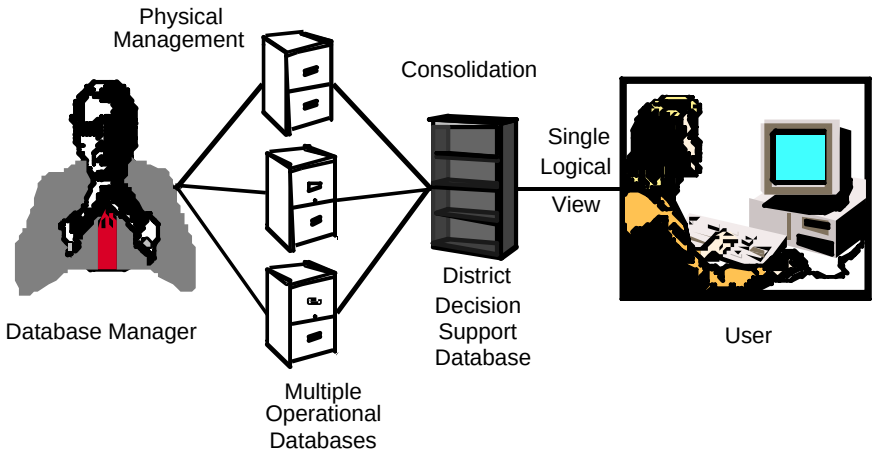
Decision support has many different meanings. In its simplest form, decision support is accessing and transforming data collected by day-to-day operations into useful information that can be acted upon in making quick and accurate educational decisions. Often this involves analyzing how the data (e.g., budget, enrollment, student achievement, etc.) has changed over time by comparing it to current data. This ability to compare plan-to-actual is essential when managing the attainment of educational and business performance objectives.

Presently it is difficult for staff to query, analyze and report data from multiple applications (e.g., student data, employee records). To address this problem, data from all operational systems could be brought together into a central repository. *Data warehousing* is the term that describes the process by which information is extracted from a variety of sources inside and outside the Department and stored in a separate database for decision support. Data from all operational systems may be placed in a central repository that is optimized for data query, reporting, and analysis of information across multiple functional units (see Figure 6-2). Additional information, such as census data, can supplement the information in the department's operational databases.



PSD should also implement a forms management system as part of its information management system. When implementing such a forms management system, the existing school and department forms will be reviewed to determine if they are still necessary or whether they could be replaced by another redesigned form. Whenever possible, existing data will be pulled from databases to eliminate re-entering of known data. Data entered into forms would be placed into databases with no further need for retyping. The forms management system can speed up processes and reduce errors.

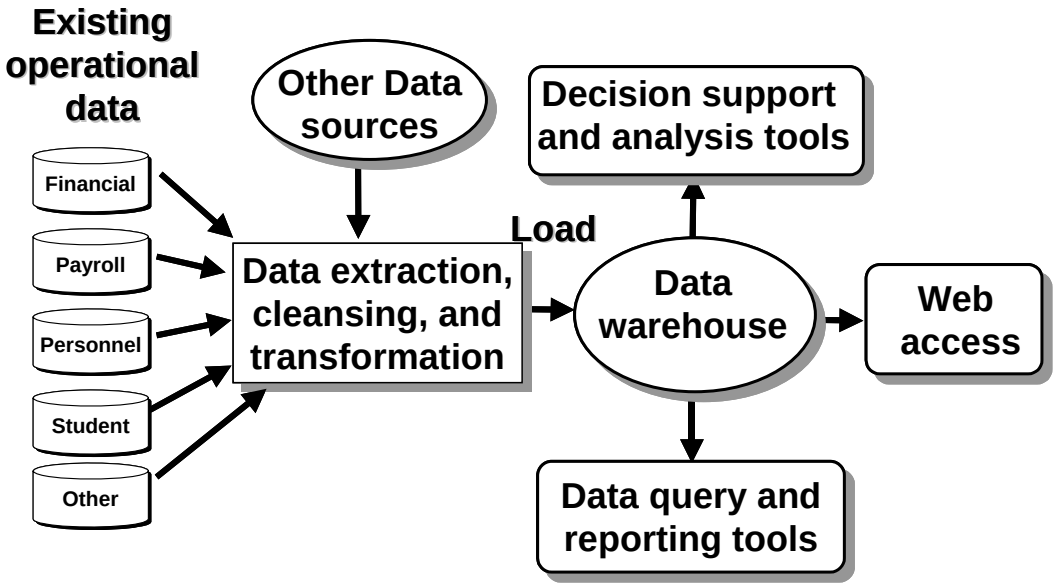
Decision support systems (DSS) are comprised of a broad range of functions and support many different users such as the casual user, the application developer, the analyst, and the administrator. As a result, DSS tools must provide a scaleable solution for a broad range of uses, including executive information systems, multimedia, and specialized geographic and statistical analysis tools. Graphical user interfaces (GUIs) are important to users for increased productivity, ease of use, and more rapid decision-making by offering flexible, innovative visualization tools.



Critical to the entire database approach is the development of an effective data model. PSD will develop a department-wide, user-oriented data dictionary to standardize all data elements, the relationships among them, and the business rules that govern them. These data elements, relationships, and rules will be common across all administrative applications.

Data must be extracted, cleansed, and, when codes are used for fields, transformed into a common definition before loading into the data warehouse (see Figure 6-4). For example, the student and human resource systems might use different codes for

ethnicity, which must be mapped into a common definition to allow analysis of data across all systems. The data could then be reported and analyzed using a variety of tools most appropriate to the user's needs.

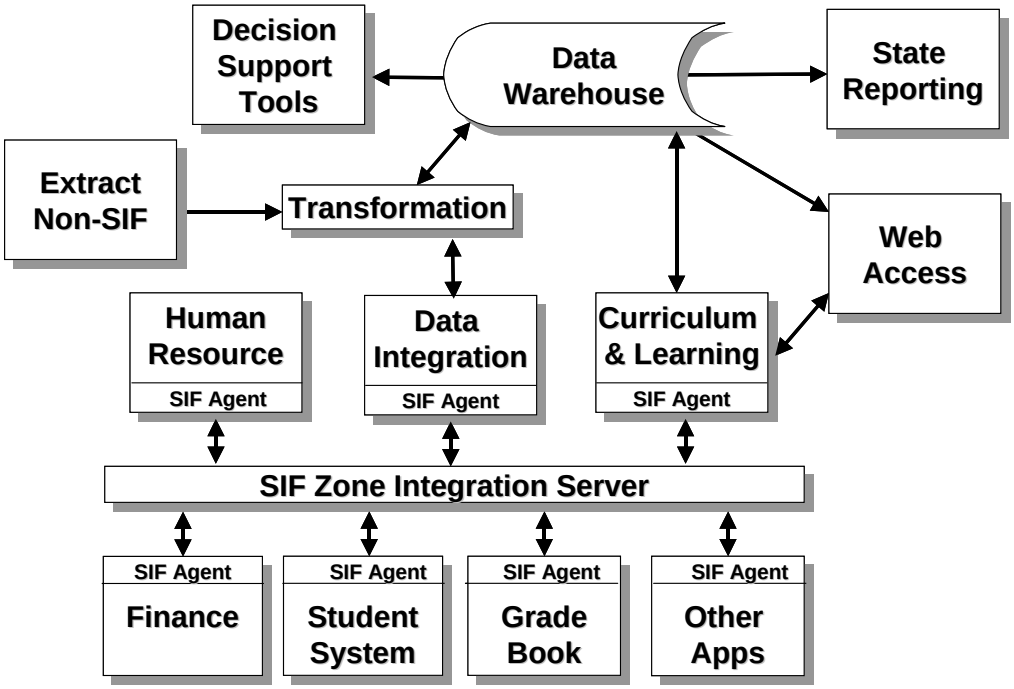


Obtaining and integrating data from many different systems is the most difficult, time-consuming, and expensive part of creating a data warehouse. The Schools Interoperability Framework (SIF) was established to address this problem. SIF is a K-12 industry and educator supported initiative to allow administrative and instructional applications developed by different vendors to exchange data with each other. SIF achieves interoperability by defining:

- Standard naming conventions for this shared data,
- Standard formats for shared data (e.g., student demographics information),
- Standard codes for shared data elements (e.g., ethnicity codes), and
- Rules for interaction among different software applications,

These shared standards enable the transfer of data among programs seamlessly in real time or through batch data exchange, without the need to re-enter data or to purchase expensive add-ons or third-party data transfer programs. Since SIF is vendor and platform neutral, it will enable different applications to exchange data efficiently, reliably, and securely regardless of what platforms are hosting the applications.

The SIF data exchange will be the core strategy for cost effectively populating and maintaining the comprehensive data warehouse of school and Department data (see Figure 6-5). PSD will require future administrative and instructional applications to be SIF compliant and will seek to obtain SIF compliant versions of existing applications.



Early implementation of a data warehouse will pay big dividends. It will allow web access to information in existing applications without having to wait for a replacement system. It can insulate users from the transition of existing applications to new applications. The users will access the data with the same tools in the same way even though the underlying applications change. PDS can begin by outsourcing the research and development of a set of functional requirements for the data mart/data warehouse production as well as the technical specifications for data warehouse design and development. Over time, information on students, finances, and employees will be incorporated.

Providence should standardize a set of common information processing tools to be used by network participants by selecting applications that, to the extent possible, are effective and can operate on both Macintosh and PC computers. By choosing applications based on this criterion, Providence School Department will more easily transfer documents across the network. These documents can then be consolidated, revised, and printed, regardless of the type of workstation on which it was created. In addition, a standardized suite of common tools will simplify use, lower training costs, and minimize the cost of supporting different software applications performing the same function. These common network applications should be:

- Easy-to-use and should have a graphical-user interface (GUI)
- E-mail and Web-enabled
- Able to access structured query language (SQL) and ODBC databases
- Able to use a consistent set of keystrokes and icons standardized across as many of the applications as possible
- Able to access the data formats of other applications, ideally without requiring conversion

These standards are necessary to ensure that the look, feel, and operation of documents and data are retained if they are moved from one person to another or between different client platforms. To maintain data integrity, no data files created by applications, other than temporary files, should be kept on the Macintosh or PC. The local disk should be used primarily for temporary files, disk caching, virtual memory swap areas and frequently used applications.

PSD should take the following steps to implement a department-wide decision support/data warehouse system:

- Develop an information architecture that supports department functions.
- Develop a dictionary of identified data elements that describes element storage, location, content, meaning, and validation.
- Identify data to be extracted from operational systems and develop data extraction/ cleansing routines.
- Create a unified, non-technical user data dictionary of relevant information. A user will not need to know on which system the data is stored to access it.
- Research and write functional requirements and detailed specifications, and procure a data mart/data warehouse.
- Continue to expand WAN to all sites and connect workstations to LANs to provide access to data warehouses from any workstation.
- Establish the update frequency of data from different systems to the integrated operational database.
- Web-enable the data warehouse to provide maximum but secure access.
- Identify unmet reporting and decision support needs of classrooms, schools, and department departments. Identify different types of tools that might best address different decision-support needs. Ensure that all new software procured supports all reporting levels used by PSD. Ensure that the most common needs can be met with a Web-based tool.
- Research and write functional requirements and detailed specifications, and procure decision-support client software.
- Implement easy to use reporting tools that allow users to obtain information when they need it in the proper format without requests to IT for special reports for most of their data needs.
- Develop data access profiles based on job functions. Develop standard views of the data and standard reports.
- Provide training to users and IT staff on how to use tools to improve decision making.
- Expand access to existing applications through the use of software that makes the data accessible through Web browsers operating over the new WAN network.
- Make extensive use of Open Database Connectivity (ODBC) to access data on different systems and databases during the transition.

PSD should start with the implementation of a data warehouse in a specific functional area that can evolve into a department-wide warehouse. The implementation of a data warehouse in a functional area is often called a data mart. Whether a data mart is developed centrally or by personnel in a functional unit, the central information group must have the responsibility and authority to ensure the integrity of the evolving overall department-wide data warehouse.

Listed below is an overview of potential requirements for the Decision Support System:

- The user interfaces of data analysis and reporting tools for the DSS must be as user friendly as possible, and must accommodate all ranges of computer experience in the Department.
- The data needs to be available to all appropriate users through easy-to-use data reporting and analysis software tools.
- A unified non-technical user data dictionary of relevant information should be created so that a user need not know on which system the data is stored in order to access it.
- The update frequency of data from different systems to the integrated operational database needs to be established.
- The DSS must provide up to date progress reports on the Superintendent's Indicators of Student Achievement to users at all levels of the Department.
- The DSS must provide ad hoc analysis capabilities that allow users to examine the relationships between a wide range of variables and measures of Student Achievement.
- The DSS must support tracking of a wide range of possible measures of student achievement including multiple performance assessments throughout the school year.
- DSS must provide easy access to reports that disaggregate student information databases needed to answer commonly requested breakdowns.
- The DSS must include student information from the Department's REG 2000 student information databases needed to answer commonly asked questions.
- The DSS must provide easy access to standard reports with appropriate content and scope to meet the needs of users in different roles in the Department.
- The DSS must integrate data from all key Department databases including student, personnel, financial, and other types of databases according to milestones set by the vendor and agreed to by Department.
- Information in the DSS should be capable of being updated or refreshed on at least a daily basis.
- The DSS must be capable of handling the growth in the number of different types of queries (without architectural changes) as the data in the DSS becomes more diverse.
- The DSS must allow the addition of new data fields and formulaic transformations of data with a minimum amount of work.

- DSS predefined reports must be accessible from common browsers, including Internet Explorer and Netscape.

- The DSS should be capable of restricting access to information according to the role and/or identity of the user.

2.10 Technology Standards, Policies and Procurement

Technology utilization, procurement and management standards and polices will play a significant role in the successful implementation of the major components of the Technology Plan. It is important that the Department direct the appropriate resources to their development, continued review and implementation.

- *Goal*

Goal 14: **"**Create an environment and provide resources that will allow for the planning and organizational development enhancements necessary to support the central premise."

- *Technology Standards*

The Providence School Department is currently implementing a standardized approach to obtaining, distributing and configuring computing devices through the Technology Department. The technology department handles all aspects of the process from initial vendor contact through setup and configuration at the site. The current goal of supplying 2 PCs in each classroom has been attainable and effective in providing a minimum level of computing equipment per learning space.

While this approach has been effective supplying standardized computer equipment to classrooms, it has not yet been extended to reach beyond computers to include, other equipment and software necessary within the classrooms and other administrative spaces outlined in this document. As shown in the demonstration classrooms in section 3 of this document, additional equipment must be provided to realize the goal of implementing technology as part of the standard curriculum in each school. Additional devices including printers, TV monitors and projectors should be included as part of an ongoing program of technology equipment that is standardized.

Another hurdle to equipment standardization is the means by which schools obtain equipment. A minimum level is being supplied by the Technology Department that includes the standardized portion of their equipment allowance. However, each school is provided with additional dollars to spend as they see fit. The decisions regarding how and on what this money is spent come solely from the staff at each facility.

If, in some cases, the staff and administration at that facility have made a commitment to implement greater levels of technology then, technology equipment will be purchased and provided. This improvement will provide a greater level of technology but often times it is done without the PSD Technology department involvement. The consequences of this are:

- Multiple vendor equipment requiring additional service contracts, and

- Inadequate centralized control and inventory of what equipment exists within Providence Schools.

While staff and administration at some schools decide to implement greater levels of technology, others use their budgets for different purposes. The decisions about how

money is spent can vary widely and are dependant upon the staff and administration's view of technology in general. A number of factors influencing the level of technology integration include the following:

- Program specified for that institution,
- Promise or lack of support from the School Department,
- Future support to procure technology, and
- Comfort level of staff at that institution with technology.

When this is the case, minimal technology is sought in favor of other programs and equipment. This scenario leads to an inequitable level of technology throughout the department. What technology equipment that does exist has been provided by the central office. If anything above or beyond has been purchased, there is no system in place to insure that it conforms to a department standard.

The technology department has expressed a desire to craft a school-wide standard that effectively monitors and controls what is implemented within the school department. Multiple benefits will follow from a more standardized approach to technology equipment:

- Inequities of technology between schools is avoided, helping to ensure equal access to technology across the department,
- Servicing and Licensing contracts and agreements are reduced to fewer vendors,
- Ongoing operation and maintenance are streamlined due to fewer parts,
- Economies of scale are realized due to purchasing in greater quantities,
- Equipment and systems become interchangeable due to standard parts, and
- Training for equipment support is effectively reduced.

Technology Standards Implementation Approaches

The Providence School Department has expressed a desire to standardize how technology is used and how it is accessed by students, instructors, administrators and the community. As a result, some of the initial foundations have been implemented and should continue to be expanded. As a path forward, the PSD should consider the following steps as a structured approach.

First, it is necessary to create Technology Standards and Guidelines with input from instructional and administrative staff, industry experts, the community and students. The Standards should address technology systems as well as technology equipment and applications. It will be beneficial to produce a set of standards that is concise and useable by the different user groups as well as providing the standards in an easily useable format. Once these have been created, they should be distributed to the decision makers at each level to disseminate as needed. Part of the process of standardization will be to ensure that all parties involved are using the same criteria for technology decisions.

Once the standards have been defined and distributed, the technology department should implement a schedule for procurement. Since it may not be realistic to

implement the changes at once, an estimate of the implementation timetable should be created for the school system. This will aid in determining budget allocations since equipment types and quantities will be a known factor.

As the standards are implemented over time, a system of monitoring if those policies are realistic and adhered to should be created. This will give the policy makers a tool to assess the effectiveness of the standards program. As policies are enforced and patterns emerge about usage and implementation the standards and guidelines should be reconsidered to create a more effectively set of protocols to follow. The review process should be ongoing with major initiatives occurring every few years as the plans are implemented.

- *Technology Policies*

Currently schools vary in how and when staff and students may access and utilize technology. Much like the process of how an individual school budget is spent, policies outlining procedures for student access to computers around the facility at different times are created and enforced by the administration and staff at each individual facility. While a number of schools encourage student access and use of technology other schools limit access for an array of reasons. These include:

- ❑ Lack of expertise to support the equipment
- ❑ Lack of supervision
- ❑ Lack of security for often expensive equipment
- ❑ Lack of available equipment
- ❑ School leadership attitude towards greater technology access

Due to the widely varied schools and wide range of populations those schools serve, some schools benefit from programs and funding opportunities that are not available to other schools.

While site-based decision-making will always exist (and should exist), a formal policy from the central office will provide for a smoother transition to instituting the Teaching and Learning Model and tighter control of how and when technology is accessed. During interviews with administrative staff, instructional coordinators, principals and other department staff, it became clear that many were uninformed on acceptable use policies and often times confused as to the where and how to access that information. A critical negative effect from this is a feeling of frustration by the potential users towards technology that often times results an overall reduction in the use of technology. Implementing a clear and concise policy regarding technology will provide the end users with a level of assurance that what they are doing is both supported and encouraged by the school department. Some critical areas where a standard policy should be implemented include:

- ❑ User Training
- ❑ Internet filtering and fire-walling
- ❑ Installation and maintenance of new equipment
- ❑ Replacement and upgrade of equipment

Technology Policies Implementation Approaches

As the Technology Standards become ubiquitous within the school system, it will be necessary to have policies regarding how that technology comes into use during instructional and non-instructional time. A stance from the central office should be clearly defined as the general vision for how technology should be used within the school system. However, a more specific set of policies will need to be created based on the institution type and user population. The over-arching policy guidelines should be used a starting point to work from for each localized population.

The stakeholders should have the greatest influence over policy decisions and those include the instructional staff, technology department and administration but should take into account the end user's ideas and comments. As with the technology standards, the policy guidelines should be created in a useable format that is easy distributed across the school system and accessible to those with use the technology and equipment. It should include specific policy sets for individual populations such as elementary, middle and high schools. Additionally, policies regarding community and after-hours should mesh with the ideas the school system is representing.

One key element of the policies regarding how technology is utilized amongst the administrative and instructional staff is that of communications. Throughout the interview process it became evident that electronic messaging was largely being overlooked by to great a percentage of the staff. The policies should encourage electronic communications as a means bringing new efficiency to daily operations and should be mandatory as a way of communicating within the department.

- *Technology Procurement*

Classroom technology equipment procurement practices will play a significant role in the successful implementation of the new Teaching and Learning Model in the demonstration classrooms in all schools and the three demonstration schools.

The PSD has and continues to procure technology through a number of different sources. These sources have provided a substantial amount of technology and equipment over the years and should be continued to be utilized by the school department. To varying degrees, these sources will continue to be reliable ways of procuring technology but should not be viewed as the only sources available. It is critical that the existing funding sources, such as E-Rate, are maximized. If the resources do not exist within the department to explore additional pockets of funding within existing programs and grants then serious consideration should be given to working with industry experts to seek out and utilize those sources. In the past, the department has received funds for technology procurement from:

- ❑ Title 1 Funds
- ❑ Title 2 Funds
- ❑ Carl Perkins Grant
- ❑ Toyota Grants
- ❑ Federal Challenge Grant
- ❑ E-Rate
- ❑ Varying Private Grants

The department was also the recipient of an eight million dollar Carnegie Small Schools five-year grant to create smaller, theme oriented high schools as a model for Providence's 10 high schools. The grant is paying for planning, community outreach and Professional Development.

The Providence School Department received a Gates Foundation Grant for literacy which provides each school with an allocation of funds to decide how the dollars are to be used within the grant parameters of administrative guidelines. However, the central office did not have a policy in place that would form some of the guiding principles in deciding how to use the money, therefore a wide range of uses were recorded. Some schools had clearly identified uses for the money while others could not effectively determine what would be most beneficial for their individual school. It is imperative that the Providence School Department follow through on implementing their vision of technology by providing the leadership that schools and administrators are currently without.

The current system established from the Central office allows each school to budget for computing equipment. This information is transferred through the technology department who in turn places the order of standardized equipment. Each individual school budgets for their own educational computing equipment purchases. Unfortunately, no system is currently in place to allow schools to order standardized technology equipment such as peripheral devices and projectors. Additionally, the current system in place for ordering and specifying computers through the central office is largely a hardcopy paper process. The lack of an electronic ordering and tracking system adds unnecessary delay to the process and creates difficulty in tracking the flow of information. Consideration should be given to implementing and automated and electronic process to speed the flow of information and create a more efficient process.

It is understandable that such a wide range of opinions was found within the department regarding technology procurement due to the varied emphasis placed on technology in education by different individuals. For a real shift to occur, the Central Office must project its desire to have technology integrated into the curriculum and show their support of those desires by providing the mechanisms available to procure and the necessary equipment. Part of this process must involve demonstrating the real change that can occur in education when technology is used as part of the learning process. For that to occur, the technology must be available and in place for instructor's and students to use.

The technology office is in the process of working more closely with administrator's and principals to show them the efficiencies gained through technology both instructionally and administratively. This effort is making strides in having larger portions of the individual school budgets being allocated for technology acquisitions due to the change coming from within the school rather than from outside. It also aids in procuring a more standardized set of equipment and applications since the technology provides expert advice and recommendation as to how the money can be used most effectively.

Technology Procurement Implementation Approaches

Procurement has largely been accomplished on a micro and macro level within the school system with little overlap between the two methods. While this method has proved successful in a number of cases, it has not served to standardize technology across the school system or to increase the fair and equitable access to technology. To effectively reach the goals of implementing a curriculum that prepares students to succeed in the 21st century, users need access to the technology in an environment that allows them to explore and learn with it. The Providence School Department must make a committed effort by using large and small streams of available money as well as continue to expand the base from which that money comes.

First, the central office should continue its successful program of finding procurement paths through local, state and federal avenues. Those sources outlined above, will allow the school department to continue to supply schools with standardized equipment that is often purchased at significant discounts. However, a renewed commitment should be made to exploiting those existing sources in ways that have not been in the past. A task force should be assigned to uncover any gaps the school system may have been missing from those funding sources. E-Rate has not been maximized to include all eligible items during the construction process for a new facility should be explored as a possible way increase equipment related to external and internal connections. Consideration should also be given to procuring equipment through leasing. Multiple departments within the school system expressed a desire to run a few pilot programs of leased equipment to quickly increase the level of technology present in the department by at the same time allowing those costs to be absorbed overtime rather than all at once. The added benefit of continually falling prices on technology allows the school system to turn the lease in at the end of the term and essentially procure the "latest and greatest" for the same amount of money.

Second, the Technology Office should expand and systematize its program of working alongside decision makers at the individual school level. Being available to guide those decision makers as they procure equipment from sources beyond the scope of the Central Office will allow the end users to obtain equipment that matches the school systems educational goals. Too often equipment is purchased because it is seen as the latest and greatest when in reality only 10% of the capabilities will be utilized. As well, the technology office will be able to assure the administrators and principals at the school level that they are there to provide the necessary support for the equipment. As user's become less intimidated by technology and understand that the school system has a system in place to support their use of that technology the barriers to procurement and implementation will fade away.

Third, the procurement of technology should be monitored on the central office level by the technology department. The establishment of an electronic tracking and inventory system will provide valuable information for maintaining an inventory of supplies, tracking equipment as it travels though the school system and allowing lifecycle and equipment upgrade budgets to be realistic and accurate in size and scope. Having a tight inventory of technology will increase the likelihood that budget will be allocated to a particular item since the need is easy to document

Chapter 3
Facility Design for Technology

Central Premise of Technology Plan

Significant and continuing improvement in student achievement requires:

- **A major paradigm shift creating a new classroom Teaching and Learning Model where;**
  - The teachers' role changes from predominately lecture to that of a facilitator, mentor, and manger of instruction;
  - Students become active participates in a collaboration, project based, small group learning environment;
  - Students acquire critical thinking, problem solving, information analysis, and life long learning skills;
  - Parents and community are engaged; and where
- **The new Teaching and Learning Model is effectively supported by an infusion of ubiquitous classroom technology.**

This Chapter contributes to the Central Premise by:

- defining the T&L Models' impact on learning space design
- defining facilities design requirements to support premise

Chapter 3 Facilities Design for Technology

3.1 Philosophy and Approach

In order to provide a new Teaching and Learning Model in the classroom, it is important to define and realize minimum standards for facilities design, so that the classroom is well equipped for the technology of tomorrow, as well as today. The standards, methodology and codes that follow in this chapter should be followed in every school in the Department, whether accomplished through renovation, reconstruction or building a new facility.

Given that Providence School Department is currently undertaking a Master Planning effort, it is necessary for architects and planners to consider the best way to fold technology into the fabric of the buildings under design and construction. The elements of design described in the following section will help to ensure that technology is considered at every phase of each project, and that the systems will seamlessly blend with the classroom environment.

3.2 Design Process

In order for facilities design to become the vehicle that implements the teaching and learning paradigm shift discussed in Section 1, changes will be necessary in the composition of the architect's design team and the school design process. Past school design has seen space typically drive classroom layout, furnishings, and equipment. However, in a technology intense and learner-centered school, learning area layout, equipment, and furnishings should drive space and school design.
If the learning areas coming forth from the school construction program are to truly reflect Providence's desired learning environments, then the architect must place greater emphasis on:

- Ensuring that the educational specifications reflect the desired teaching and learning environments described in Section 1. The generic descriptions must be defined for each school's unique requirements.
- Translating the impact of these teaching and learning environments on classroom and other learning space layout and design. Sample layouts reflecting current trends in teaching and learning environments are in the "Typical Classroom Components" parts of Section 2.
- Translating the impact of these teaching and learning environments on the schematic design of the building.
- Ensuring that the appropriate technology is selected from the Department's standards to match the specific schools' functions and student target population. To accomplish the above it is imperative that:
  - The architects' design team consists of personnel knowledgeable and experienced in instructional practices for these desired learning environments.
  - Greater and earlier emphasis is placed on the layout and design of classrooms and other learning spaces to effectively accommodate and encourage these desired learning environments. Sample layouts will provide the architect with guidelines for technology component locations within the classroom and lab.

- The architect has responsibility for the design, specification and selection of learning space furniture so that it may be integrated into the learning space design and layout. Selection of furniture will be coordinated with the technology designer where equipment is utilized in the classroom and labs to ensure they comply with the intended use and would be adaptable for later modifications.
- Schematic designs be developed after the layout and design of learning spaces and reflect the instructional decisions concerning technology applications.
- Open forum discussions, i.e. charettes with department and school staff should be conducted at an early stage to create desired learning environments for the specific school.
- The primary members of the architects' design team that must contribute to planning and design of technology support for teaching and learning spaces are the architect, educational technology consultant, electrical engineer and telecommunications consultant.
- Community access needs must be assessed to anticipate the utilization of facility technology spaces. Location of rooms and their accessibility, without jeopardizing security, are critical to the facility design.

The architect's approach to school design should include the following technology related tasks in each phase of the design.

- *Schematic Design*

Task 1: Instructional Planning

The architect and educational technology consultant will develop or review the existing Educational Specifications for the specific school. The charettes process should be used as a key approach to introduce, debate, and determine specific goals of the educational approach for the school and formulate facility design and equipment requirements to support the desired teaching and learning environments. This process should involve the Department's curriculum specialists, school based instructional and administrative staff, architects and educational technology consultants in intense design sessions.

The charette sessions should result in the development of typical classroom and other learning area layouts that support the school department's teaching and learning methodology and desired learning environments. It is important to develop typical classroom layouts for each academic discipline at this early stage so that space sizes, number of students, furniture, and technology equipment configurations can be incorporated into the schematic design.

A significant part of the instructional planning process is to determine the desired classroom, science lab, media center, computer lab and other instructional uses of computer and video applications. The educational technology consultant should serve as the technology facilitator and information source for the review and selection of computer and video technology systems. The consultant should provide information concerning:

- ❑ Basic levels of interactive video systems
- ❑ Characteristics of alternative school-wide computer network designs to support distributed classroom computing, computer labs, media center, multi-media, and administrative computing.

- Characteristics of alternate methods of teacher presentation to support multi-media utilization.

Task 2: Technology Space Allocation

The educational technology consultant should continue to assist the architect in the finalization of the schematic design by:

- "Tweaking" typical classroom layouts to fit into the schematic design so that they maintain the incorporation of technology supporting the desired learning environments.
- Determining the number, location, and space requirements of telecommunications rooms.
- Developing technology space adjacencies that reflect the desired relationships and functions of the media center, technology labs, computer labs and other learning spaces and ensure that these adjacencies reflect the instructional philosophies of the school and department.

Task 3: Technology Descriptions

The schematic design document should include narrative descriptions of the functionality of the following building wide technology systems. These descriptions are critical to ensure the final school design reflects the instructional philosophies and desired teaching and learning environments of the school department. Once the Design Development and Construction Document Phase begins, there is little opportunity to affect these critical aspects of the design. Any significant design changes beyond the schematic design are expensive and time consuming.

- The communications infrastructure and computer network topology planned for the school.
- The instructional video distribution system, including the video distribution cable plant, including the type(s) of video projection system selected for the teachers workstation.
- The alarm detection and video surveillance systems.
- Telephone cable plant including equipment and the voice horizontal and riser cable plant planned to support the telephone system.

Task 4: Statement of Facilities Requirements

The telecommunications consultant should provide the architect a "Statement of Facilities Requirements for Technology" which is intended to provide other members of the design team such as the Mechanical, Electrical and Plumbing contractor (MEP) with the necessary criteria to proceed with detailed design. The "Statement of Facilities Requirements for Technology" should contain the following information:

- Voice, video, security and data narratives developed in the schematic design phase to describe the communications systems.
- Communications Network Outlet (CNO) Symbol Set: Detailed description of each CNO type to be shown on the (1/8" scale Technology T drawings) generated in the Design Development Phase. The description should include faceplate, number and type of voice, video, and data connection jacks, conduit and device box requirements, and the number and type of cables serving the CNO.

- ❑ Description of environmental requirements for telecommunications rooms.

- ❑ General electrical requirements to support technology in:

  - Classrooms
  - Technology Labs
  - Computer Labs
  - Media Center
  - All telecommunication rooms
  - Science labs
  - All other technology spaces

- ❑ Electrical grounding requirements of communications infrastructure equipment rooms.

- ❑ Specifications of size and location of all in-wall vertical and above door horizontal conduit required supporting horizontal voice, video, and data cabling for CNOs.

- ❑ Location and specification pathways (sleeves, chases, etc) to support riser equipment room interconnect voice, video, and data cable plant.

- *Design Development*

At this point the Information Technology consultant should begin the detailed system designs of the voice, video, data and security systems using the approved building footprint and information provided in the schematic design.
The 1/8" scale technology drawings developed during the schematic design should be finalized with the exact Communications Network Outlets (CNOs) and contain expanded detail design. The detailed design and specification of voice, video, data and security communication infrastructures should include:

- ❑ School-wide structured cabling system:

  - All horizontal and backbone voice and data cable
  - Network outlet wall faceplate configuration and labeling scheme
  - Distribution and riser cable paths
  - Wireless topology
  - Telecommunication room layouts
  - Telecommunication room patch panel, switch and router equipment specifications

- ❑ School-wide instructional video distribution design to include specifications for:

  - Cable plant
  - Wall outlet configurations and labeling scheme
  - Cable distribution pathways

- ❑ Alarm detection system design to include specifications for:

  - Cable plant
  - Detection sensors
  - Alarm equipment

- ❑ Video surveillance system design to include specifications for:

- Cable plant
- Camera types and locations
- Security room layout and equipment

❑ Draft set of Division 17000 Specifications

- *Construction Documents*

Subsequent to the client review and acceptance of Design and Development Phase documents, the IT consultant will make approved modifications, finalize detailed design and produce Construction Documents to include:

❑ Division 17000 Communications Infrastructure - Data Specifications to be used in conjunction with the network design drawings for the installation of the computer network.

A set of network technology (T) design drawings containing video outlet locations and cable layout, head end equipment plans, and interconnect diagrams for installation for the school-wide cable TV distribution system.

❑ Division 17000 Communications Infrastructure - Video Specifications to be used in conjunction with the cable TV network design drawings to procure the installation of coax cable and head end equipment.

- *Construction Administration*

The educational technology consultant and/or the telecommunications consultant will provide the following services during the construction phase:

❑ Review working drawings, equipment specifications and samples provided by contractor for approval of “as equivalent” and respond to Requests for Information (RFIs).

❑ Conduct site visits and inspections to ensure quality and workmanship of cable and wire closet equipment installation, during discrete phases of construction.

❑ Prepare the final “punch list” of yet-to-be-completed tasks for cable installation at the request of the PMF.

❑ Supervise contractor testing of completed cable system and review results for compliance.

- *Compliance Review / Commissioning*

Commissioning is the process of performance testing and measuring them against acceptance standards. Each Communications System should have a “Commissioning” paragraph within its respective Division 17 CSI-formatted Section. At the minimum, “Testing” and “Demonstration” Sections should contain criteria that allow the full performance of the system to be visible for compliance review. Included within the parameters for commissioning each system should be:

❑ Cable length, performance testing, continuity, and standards-based installation;

❑ Pathways properly installed, with proper support of cables to minimize damage and allow for quick access to the cable pathway;

- ❑ Labeling present and accurate at all cross-connects, telecom rooms, and service entries;
- ❑ Proper environmental conditioning for all telecom rooms: temperature, positive air pressure, humidity levels, lighting, and room layout;
- ❑ Equipment properly grounded, without ground loops, interrupts, shorts, etc…
- ❑ Intrusion Detection has been correctly programmed to function as the premises warrant;
- ❑ Telephones have dial tone and can access voice mail, transfer calls, and perform all functions laid out in the specifications;
- ❑ Intercom and Master Clock systems are accurate and performing as specified;
- ❑ Visual confirmation that each system performs as specified:
  - Television channels appear clear and without interruption throughout (low and high channels);
  - Specified television channels have been designated for in-school media and are connected to DVD, VHS, and other media sources;
  - Computers are able to "ping" all areas of the specified Local Area and Wide Area Networks;
  - CCTV cameras are oriented correctly, and recording clear and useful images;
  - Door and window contacts are properly aligned and appropriately placed;
  - Equipment is neatly and properly installed to allow servicing, minimize damage, and maintain clearances as required by code;
  - Adequate Power has been provided at the proper locations for telecom equipment;

And the overall appearance of the IT systems is neat, minimally intrusive and functional.

3.3 Facilities Requirements

Every school should have some combination of the four types of facilities dedicated to telecommunications systems:

- ❑ Entrance Facilities or Demarcation Point (Demarc) – secured area where incoming IT service providers terminate their cables for interconnecting with the building infrastructure.
- ❑ Telecommunications Equipment Room (TER) – Large, dedicated room containing head end and control equipment for all communications systems.
- ❑ Telecommunications Rooms (TRs) – Medium sized rooms dedicated to communications distribution equipment for distinct sections of the building.
- ❑ Telecommunications Enclosures (TE's) – Small wall mounted cabinets dedicated to communications distribution equipment for distinct sections of the building will low density CNO's.

Each school should have a single entrance facility and a primary telecommunications equipment room. Depending upon school size, a facility could have multiple additional telecommunications rooms.
An entrance facility is the area of the building where service providers' cabling enters the building and the wallboard where the first terminations are made. In renovations, the entrance facility has usually been defined prior to the new design. Typically, a Demarc takes the form of a plywood wallboard with telephone equipment mounted to it.

To size the TER, follow the following table as a minimum standard:

Table 1

Type of School	Min. TER Size Required (Square Feet)
Elementary (up to 500 students)	150 net square feet
Elementary (up to 750 students)	150 net square feet
Elementary (over 750 students)	200 net square feet
Middle (up to 750 students)	150 net square feet
Middle (up to 1000 students)	200 net square feet
Middle (over 1000 students)	250 net square feet
High (up to 1000 students)	200 net square feet
High (up to 1400 students)	250 net square feet
High (over 1400 students)	300 net square feet
Technology (up to 250 students)	300 net square feet
Technology (up to 500 students)	350 net square feet
Technology (over 500 students)	400 net square feet

For other telecommunication rooms, the Architect should reserve a minimum of 80 s.f. (8 ft. by 10 ft. recommended). Technology-intense areas may require more space for distribution racks and should be sized according to the following table:

Table 2

Number of Terminations In Service Area	Min. TR Size Required (Square Feet)
Up to 150 terminations	80 net square feet (10 x 8 recommended)
Between 150 and 250 terminations	90 net square feet (10 x 9 recommended)
More than 250 terminations	110 net square feet (10 x 11 recommended)

Telecommunication rooms should be located beginning with the TER. The TER will serve as the nerve center of the data, intercom/master clock, and security systems. The video head end equipment should be located within or adjacent to the television studio, where schools have been provided with one. Otherwise, the video head end should be in or adjacent to the media center. The telephone equipment, for Centrex services, should be located as near to the service entry or demarcation point as possible. The service area of the TER as a floor distributor should not exceed 15,000 square feet. For multi-story buildings, a TR should be present on every floor. Where possible, TRs should stack on top of one another. The service area definition should consider that no individual cable might exceed 290 feet in actual length (including vertical transitions and cable slack.) As a practical design guide, designers should not plan any cable path that exceeds 220 feet in the horizontal.

The following architectural considerations are necessary to meet the standards required for room access and design:

- Doors to TRs (minimum 3 feet by 80 inches) should open into corridor to maximize space, when allowed by code. Doors should open a full, 180 degrees. Doorsills are not permitted to TRs. Doors should be lockable.
- Walls should be painted a light color.
- TRs should have open ceilings to minimize dust.
- Floors should have a smooth finish – sealed concrete, tile, etc.
- Minimum ceiling height is 8.5 feet in TRs.

- *Service Entry and Demarcation Point*

Entrance facilities shall comply with the requirements of TIA/EIA-569A and local utility requirements. The incoming cable and other media brought to the school by various service providers must be terminated within 50 feet of visibility into each school. Therefore, the designer should provide a closed conduit system (minimum of 2 Trade Size 4 conduits) from the cable entry point directly to the TER. This system should be used to bring exterior cables directly to the TER, and terminate them within that room. If the demarcation point (demarc) is currently located at or near the service entry, the conduit system should be utilized to provide connecting media from demarc to the designated termination field in the TER. All termination fields should be clearly identifiable and labeled per TIA/EIA-606A.

Designers should provide any lightning protection or surge suppression equipment not provided by service providers, to ensure the safety of the facilities at the demarcation point. Special attention should be paid to exterior cables and routing, as the materials used in their construction can become extremely toxic upon combustion. There should be facilities and power for the Centrex-based telephone system at the service entry, including 110-blocks and backbone cabling to telecom rooms.

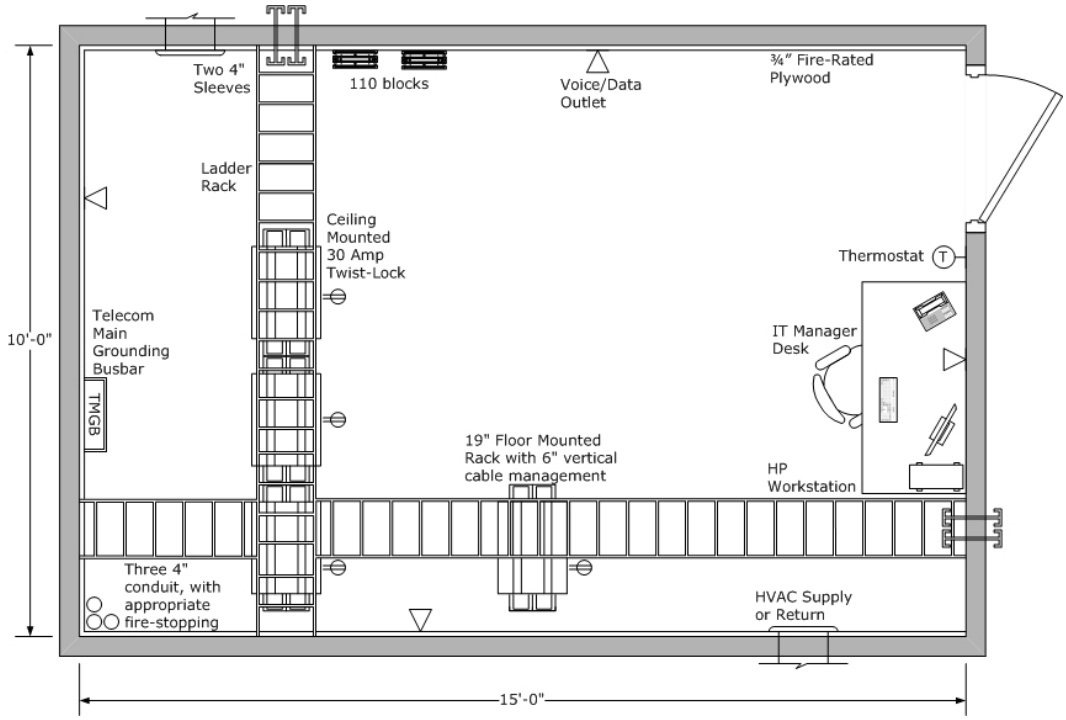
- *Telecommunications Equipment Rooms (TER)*

{Note: Previous nomenclature for this facility was “Head End Room”, Main Distribution Frame (MDF) or Main Cross-Connect (MCC).}

The TER is a multi-function, secure, climate controlled space dedicated to the exclusive use of building telecommunications systems. It shall typically house entrance facilities and demarcation points for the various telecommunications systems serving the building and the central grounding equipment for the telecommunications equipment. Every school will have a single Telecommunications Equipment Room. Access to this room shall be tightly controlled, and should be keyed separate from other school facilities. The TER should be considered a specialized telecommunications room, and depending on the data communications infrastructure topology for an individual school there could be one or more Telecommunications Rooms.

The data, security and intercom/master clock systems should locate their head end equipment within this facility. The video and telephone systems shall be located elsewhere, if possible, to minimize the number of people that have access to the TER. If a single TER must be shared among trades, the data system should be partitioned off from all the other types of systems by a lockable, chain-link fence. Special consideration should be given to layout to allow for expansion of the data network, location of additional systems as they come online, and possible location of technician work space to repair equipment, troubleshoot network problems, or assemble new equipment. Floor mounted standard open data equipment racks may be used in spaces where student/staff access is controlled, otherwise use data equipment cabinets.

The TER should be interconnected with all other telecommunications rooms (TRs) with minimum of two (2) 3-inch conduit assemblies. Guidelines for these conduit systems can be referenced from TIA/EIA-569-A. Other space and environmental requirements follow in the section below for telecommunications rooms.



- *Telecommunications Rooms (TR)*

Telecommunications rooms (TRs) should be located to minimize the number of TRs, but not violate the "300-foot rule" (restriction of horizontal cable links to less than 90 meters or approximately 300 feet). Horizontal UTP cables should be designed to run

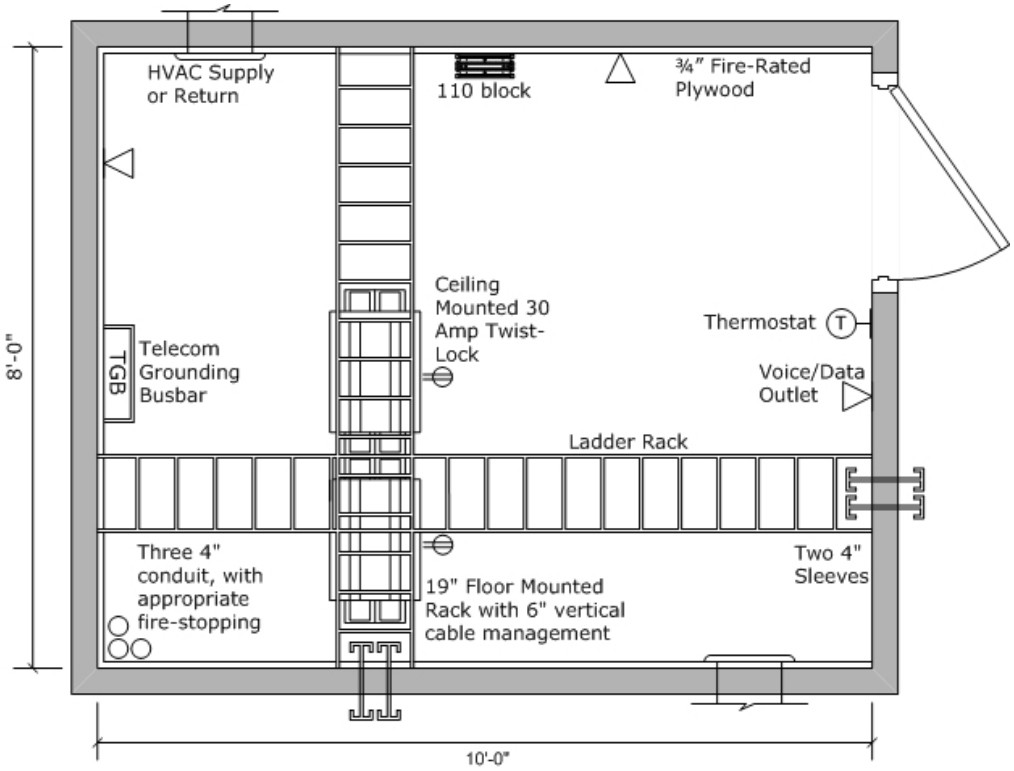
no more than 220 feet in the horizontal, to ensure they fall well within the standard. Consideration should be given for future expansion of telecommunications systems without the need to assign new rooms for equipment. Adhering to industry standards for sizing TRs based upon square footage of service area will help to ensure longevity. Recommended standards for schools are listed in the table in Section 2, Impact on School Design – Telecommunication Rooms.

Allow three (3) feet of clear working space from cross-connect areas and equipment for ease of maintenance and design with at least four (4) feet of clearance from the centerline of equipment racks and cabinets to the walls in front and to the rear of the rack/cabinet. Install wall-mounted plywood with six (6) inches of clearance from room corners. Distribution racks and cabinets should be placed with proper consideration to clearances around the equipment – taking into account sources of EMI, technician workspace, and sufficient walkways to avoid accidental disruption of service. If the space cannot be divided, then equipment cabinets should be used.

Equipment that should be located within each TR/TER should include:

- Distribution Racks or Cabinets for mounting Telecommunications hardware,
- Termination fields for fiber optic, UTP, and coaxial cables
- Switches for the Local Area Network
- Amplifiers and other equipment for the CATV Distribution system
- Rack-mounted Uninterruptible Power Source (UPS) equipment to protect IT active electronics.

The following, sample TR/TER diagram references the above mentioned elements to be considered for the designer.



- *Telecommunications Enclosures*

Occasionally, a school will be unable to dedicate a full room for IT distribution in specific areas of the building (stadium facilities, kitchen areas, etc…). In areas where there are less than 50 telephone or data outlets, a small Telecommunications Enclosure may be utilized to house patch panels, switches and cross-connect cords. It will be necessary to provide UPS protected outlets for the active electronics within the TE, and there is no space for CATV distribution equipment. Also, the analog telephone cabling should be terminated on patch panels, or 110-blocks (if the enclosure can accommodate them.) Designers should use these TE's only as a last resort and carefully consider environmental conditions, expansion needs and the impact the electronics will have on their location (i.e. some switches produce a large amount of noise.)

- *Mechanical, Electrical and Plumbing Requirements*

The routing of cabling for the telecommunications and security infrastructure requires consideration of shared space with electrical, mechanical and plumbing pathways. The pathways for low voltage cable may consist of cable trays, " J hooks", conduits and chases to provide access to the various classrooms, administrative offices and other areas from the telecommunications equipment rooms and telecommunication rooms. The low voltage cabling providing connectivity for the system requires consideration in the early stages of the project to allow for the appropriate design considerations.

The electrical requirements for electronic equipment such as computers, printers and scanners, require the telecommunications design to be completed prior to the location of electrical outlets. The IT design will provide information on the type, number and location of telecom outlets.

- Mechanical:
  - TERs and TRs should be maintained between 64 °F and 75 °F at all times. The humidity range should be kept between 30% to 55% relative humidity.
  - TERs and TRs should have an independent air conditioning system separate from the rest of the building HVAC system, especially if the building's system is centralized. The TERs and TRs generate heat all the time and may require cooling even when the rest of the building is unoccupied.
  - They should be independent and be able to run 24 hours a day, 7 days a week.
  - If the rooms are considered unoccupied, outside air (OSA) can be at the minimum, depending on local codes.
  - The more practical HVAC system for such applications would be a direct expansion air cooled system.
  - Generally, no heating is required.
  - Maintain positive pressure to avoid ingress of dust and debris.
  - The HVAC system shall be on emergency power
- Electrical:
  - 30-Amp, twist-lock receptacles are needed for rack-mounted, UPS equipment. Receptacle should be located within 12" of rack or cabinet where UPS will reside. The UPS is referenced in the Division 17 Specifications following in Section 5.
  - Generators that provide for continuous power to the electrical systems in the event of a power outage or other emergency.

- Minimum of two non-switched, three-wire 120 V AC duplex outlets, each on separate branch circuits (wired for 20 Amp capacity). Additional convenience outlets should be located a minimum of 10 inches AFF, at 6-foot intervals around perimeter of rooms.
- For wall-mounted video equipment, provide a duplex receptacle on a dedicated circuit mounted just above the top of the rack, and a duplex receptacle on a dedicated circuit at least 18" AFF in the center of the plywood sheet.
- Emergency lighting and power to TR's is recommended.
- Telecom power should be on different circuits than lighting fixtures.
- Lighting in TR's should provide a minimum of 500 lux (50 foot-candles) measured 3 feet AFF. Fixtures should be a minimum of 8.5 feet AFF.

❑ Plumbing/Fire Protection:

- Do not route wet pipes or steam through Telecom Rooms.
- Dry pipe sprinkler systems are preferred to wet.
- If wet overhead pipes such as drain lines, fire sprinkler lines, and domestic water lines are unavoidable, provide secondary drains below.
- Provide smoke detectors and connect them to the fire alarm system.
- As first preference, use a chemical fire suppression system such as Ansul 2000 system over a dry pipe sprinkler system.

- *Pathway Requirements*

The pathways used for Telecommunications cabling include cable tray throughout corridors (as required), sleeves between floors and when penetrating barriers, conduit to workstation outlets, and surface mounted raceway for special conditions. Pathway design and specifications should be included in Electrical drawings and specifications.

❑ Cable tray:

- Recommended cable tray: Cablofil EZTray CF105 (4" x 18")
- Supports may be T-Bars or Wall brackets
- Do not install cable tray to exceed bend radii of the cabling media. Gradual bends are preferred to bends of 90 degrees or greater.
- 6" vertical clearance below cable tray, when possible; 12" vertical clearance above cable tray, when possible.
- Cable tray should avoid fluorescent fixtures, with a minimum of 6" clearance perpendicular to fixture, 12" when parallel.
- Steam and water pipes should be avoided, and only cross tray perpendicularly, when necessary, maximizing possible separation.
- Electrical motors and other prime sources of EMI should be avoided at all costs.
- Should be properly grounded.

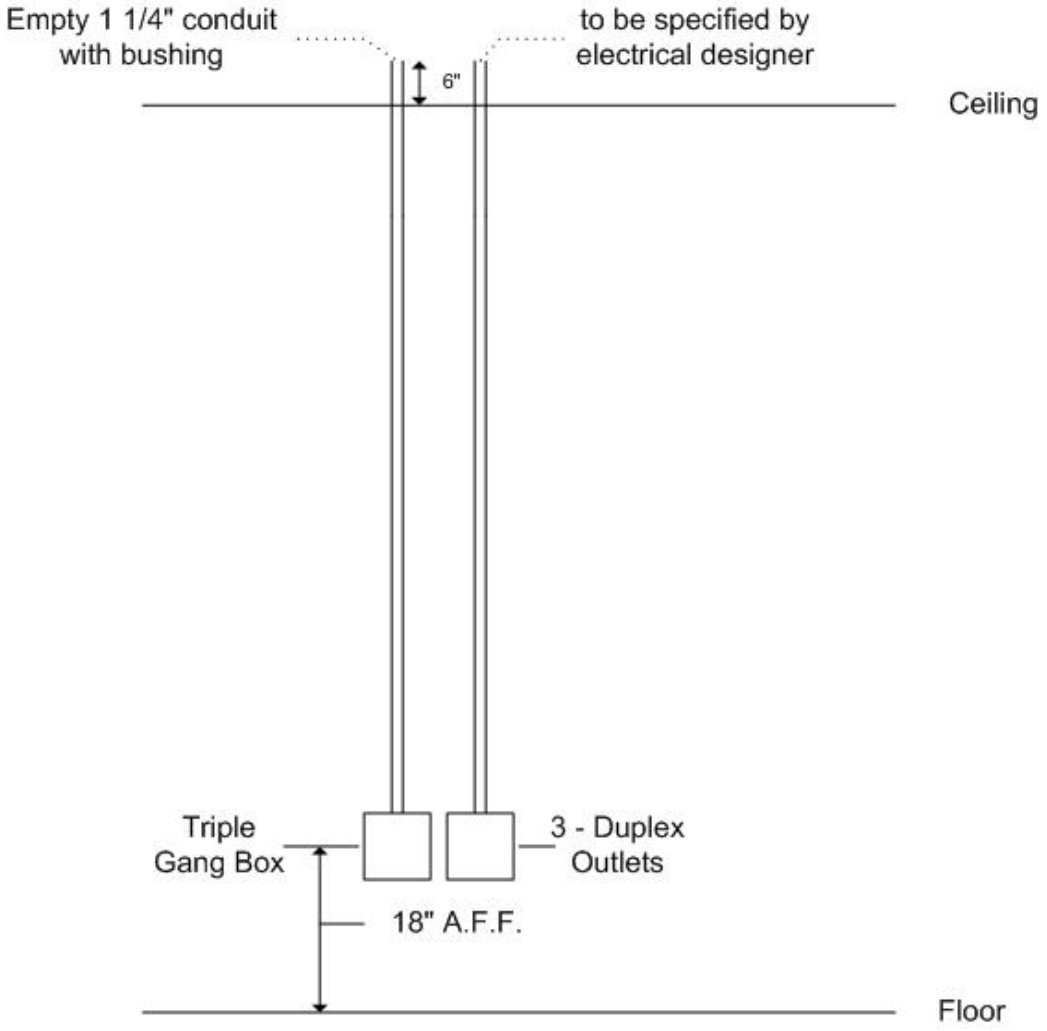
❑ Conduit and Sleeves for in wall conduits and wall penetrations:

- Sleeves to classrooms, offices and Telecom Rooms should be placed above doorways, except as noted in T-Drawings.
- Fill capacity should never exceed 40%, taking bends into account.
- All rough edges should be smoothed or grommets should be used to reduce the chance of cable damage.
- Conduits and sleeves should be properly grounded.
- When conduits or sleeves penetrate any fire-rated structure, fire stopping should be present in all phases of construction.
- A minimum of 3, 4-inch sleeves should be placed at all TR'.

- In-wall conduits should extend a minimum of 6" above the ceiling grid, and preferably bend so that cables exit the conduit horizontally.
- No more than two 90 degree bends in any single length of conduit.

❑ Where in-wall conduits are provided for telecommunications, provide a double-gang box for IT outlets.

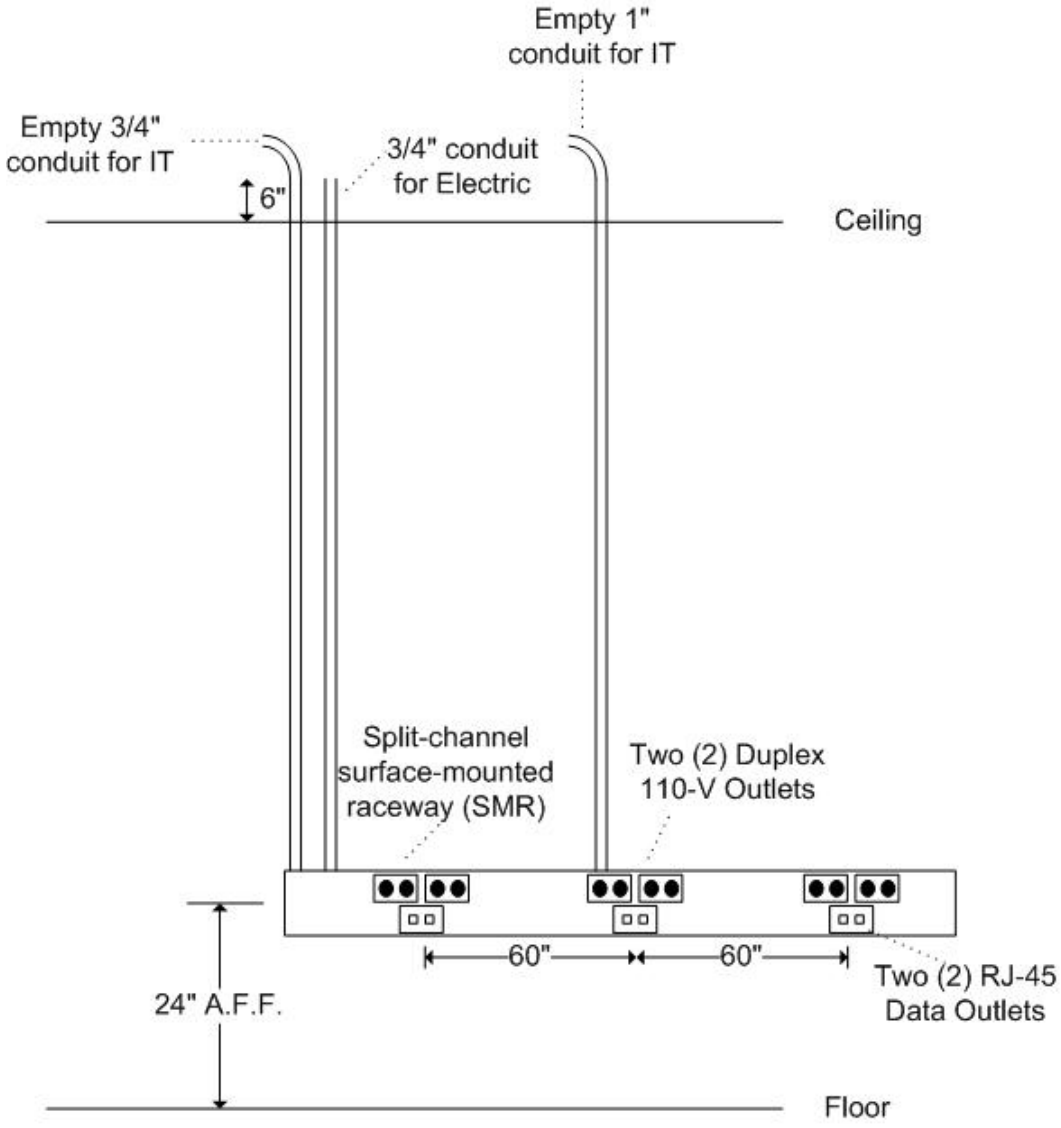
- Conduit to double gang box should be 1 ¼" trade size. One 1 ½" and one 1 ¼" conduits could be necessary for special video installations.
- Locate electrical outlets for telecommunications no closer than 3" between boxes, and no further than 6".
- Location for double-gang boxes for telecom should be coordinated with furniture selection. Ex. Computers that sit on furniture should have counter-top height telecom outlets.



❑ Surface Mounted Raceway:

- Recommended SMR: Wiremold 4000 (split-channel for data and power)
- Specify proper end fittings, faceplates, etc… as recommended by manufacturer.

- Metallic raceway is preferred over non-metallic raceway for security (more difficult to remove cover).
- Properly grounded



- *Grounding Requirements*

The school shall be provided with a telecommunications grounding and bonding infrastructure designed and installed in accordance with the applicable codes and the latest version of ANSI/TIA/EIA-607, Commercial Building Grounding and Bonding Requirements for Telecommunications. A telecommunications ground is always required and is typically found in all of the following locations:

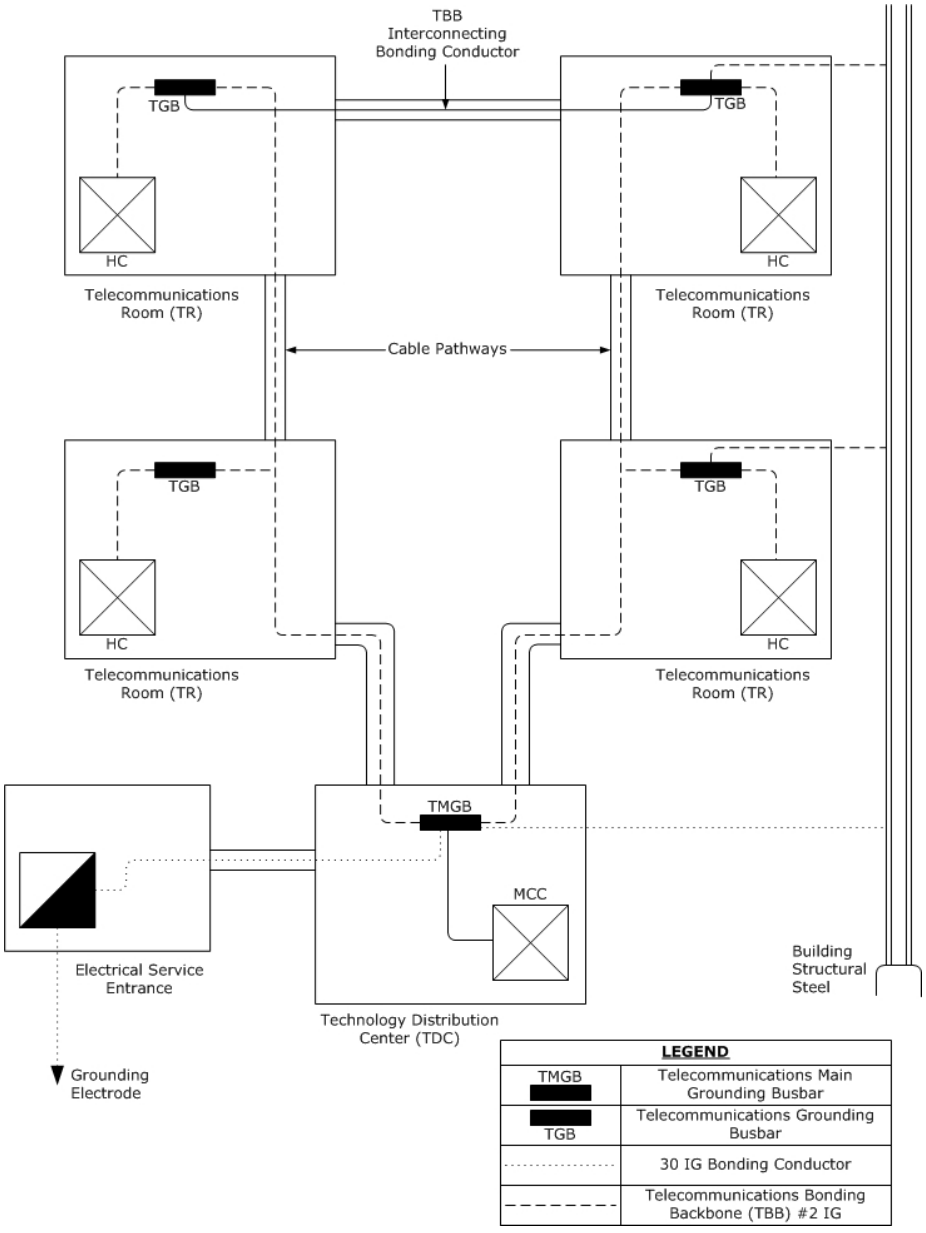
- ❑ Technology Distribution Center
- ❑ Telecommunications Entrance Facility
- ❑ Telecommunications Room

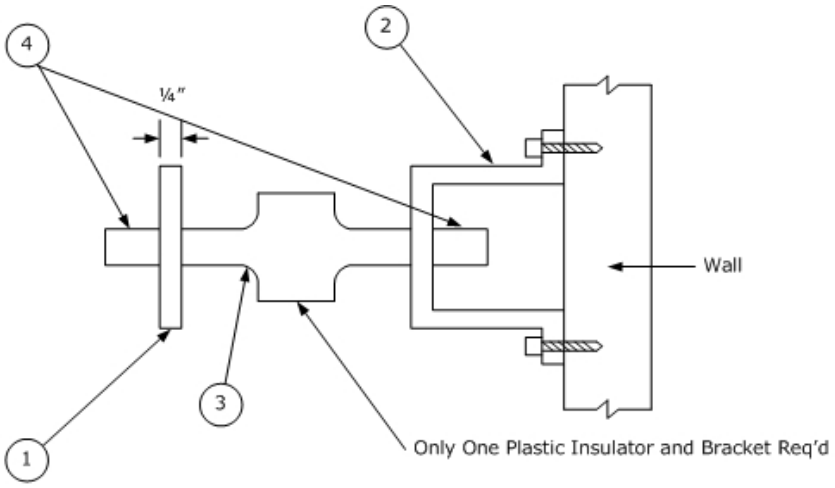
The grounding and bonding infrastructure is composed of the major components:

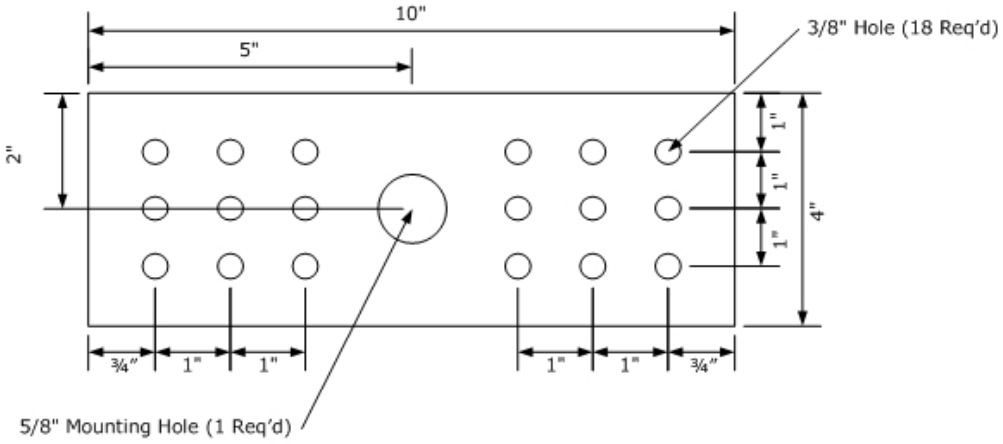
- The telecommunications bonding backbone (TBB) interconnects the telecommunications bonding and grounding infrastructure, through the TMGB, to the building service ground. It is recommended that a minimum 6 AWG copper conducted be used and installed in ¾" conduit.

- The Telecommunications Main Grounding Busbar (TMGB) is located in the Technology Distribution Center and services as the termination point Telecommunications Bonding Backbone from Telecommunication Grounding Bars in Telecommunications Rooms.

- A copper Telecommunications Grounding Busbar (TGB) is to be provided in each Telecommunications Room and is connected by the bonding conductor to the TMGB in the TDC.







No.	Req'd	Description
1	1	Solid Copper Gnd. Bar
2	1	Wall Mounting Bracket
3	1	Insulators
4	2	5/8" – 1x1" H.H.C.S.

- *Termination Facilities*

Designers should provide a passive transition between the horizontal building cabling and the networking equipment, which may be in the same or adjacent racks. All cabling will terminate on cross-connect hardware, such as patch panels, 110 blocks, and other consolidation points. The termination equipment should be selected to meet or exceed the criteria of the media selected. Cross-connect facilities should be mounted in 19" floor-mounted racks or cabinets or on plywood sheets permanently mounted to the wall.

- *Administration*

Designers should follow the requirements of TIA/EIA-606A to fully provide Providence Public School Department with documentation clearly identifying completed IT construction. Telecommunications spaces, hardware, and equipment should be permanently labeled. Cables and outlets should also be labeled with a unique identification scheme for each individual cable link. Patch cords, patch panels and equipment racks should also be uniquely identified. Access Panels for accessing telecommunications equipment in the ceiling should be uniquely identified on record drawings and labeled accordingly. All labeling information shall be maintained to reflect as-built and changes documentation. All test documents shall reflect the building's labeling scheme.

3.4 Technology Impact on Learning Space Design

The purpose of this section is to document the impact technology will have on space design and provide sample spaces including those elements. The following demonstration spaces include recommended drop types, general classroom layout and specialized space layouts for use in the design and construction of new demonstration classroom spaces. These spaces should be used as both a model and platform to test and implement new ideas that may be incorporated into daily classroom activities and as part of the students learning process. The telecommunications consultant should coordinate the contents of this section with the educational specifications for the specific school. The basis for voice, video and data technology design is a set of standardized communications network outlets detailed below.

- *Communications Network Outlets*

Communications Network Outlets (CNOs) are usually wall or floor mounted connector boxes located in classrooms or other locations within the facility. Cables from the Telecommunications Equipment Room (TER), Telecommunications Room (TR) and Telecommunications Enclosures (TEs) are terminated at the CNO. Computers, printers and other networked peripheral devices are connected to the network via patch cables running from the device to the cable connector in at the CNO. CNOs can terminate multiple cables and cable types. Each IT designer will be required to develop the specific connectivity associated with each CNO. A sample example of the types of outlets that could be included in a specific design is shown below.

Symbol	Description
D	1 Data Outlet
DD	2 Data Outlets
T	3 Data Outlets
Q	4 Data Outlets
S	6 Data Outlets
A	2 Data Outlets, 1 Voice Outlet
AV	2 Data Outlets, 1 Voice Outlet, 1 Video Outlet
W	1 Data Outlet with Inline Power
P	1 Voice Outlet
PR	1 Data Outlet, 1 Data Outlet with Inline Power
H	1 Data Outlet, 1 Video Outlet, AV Harness
L	2 Data Outlet, 1 Voice Outlet, 1 Video Outlet, AV Harness
V	1 Video Outlet

AV Harness: From the "L" CNO to the "H" CNO: S-Video and RCA (Red and White). From "H" CNO to the "PR" CNO: 1 Coax, RCA (Red, White, Yellow), and Composite

(Blue, Green, Red). From "L" CNO to "PR" CNO: 1 SVGA. Cable arrangement may be different depending upon exact equipment selected on a per school basis.

During the design and construction process for each new and renovated school, the design team and school system should work closely to ensure that the cabling infrastructure is tailored to the specific activities outlined in the educational specifications for each space type.

3.5 Typical Elementary School Classroom Layout Design

The integration of technology into the classroom requires basic components that support several "design drivers":

- Arrangement of student furniture in learning clusters rather than rows,
- Flexible technology friendly furniture with an emphasis on student tables rather than chairs,
- Flexible classroom layout, and
- Direct and controllable lighting where appropriate to allow effective use of presentation components.

Decisions on selecting equipment and furniture will also depend on whether or not it is a new facility, a modernization or a renovation.

The basic classroom technology components consist of the teaching station, student learning and technology centers, small group presentation areas, and student data connectivity locations.

- *Teaching Station*

The connectivity for the instructor's station should be located off center in front of the classroom, adjacent to a white dustless marker board (or electronic whiteboard in selected classrooms) and pull-down screen and may include space for peripheral devices and personal effects. A high/low audio-visual presentation capability to a ceiling mounted LCD projector and/or video monitor is located at the teaching station. The teacher's desk is to be located adjacent to the "L" CNO containing a combination of voice, data and video outlets. A possible high mounted video monitor ("V" CNO) allows display of a video source from the classroom VCR/DVD or the video distribution system. The voice outlet is for analog telephone and 1 of the 2 data outlets in the "L" CNO allows for future Voice over IP when the department decides to move in that direction. The front row of ceiling lights should be capable of being dimmed and controlled separately from the reminder of the lights in the learning space to allow for maximum contrast of images on the pull down screen.

- *Student Learning Center and Technology Center*

Elementary school learning environments should promote extensive use of project based learning opportunities. One or more area should be located in each classroom to accommodate groups of 2-6 students for collaboration and team building activities. The student learning center in an elementary school classroom should include tables with space for students to work with different materials, data network connectivity provided via a wireless network access point located in the ceiling and electrical power

available to support learning stations consisting of different types of media devices such as recorders, scientific instruments, PDAs and other hands-on type equipment.

Additional elements within this space should include a Technology Center allowing 2-4 students to work as a team or independently using computing devices. This space should include specialized networked equipment such as printer, scanners, and desktop pc's connected through hardwired connections to the data network.

- *Small Group Presentation Area*

An integral part of the elementary school classroom will be a presentation space so students can effectively present their findings to their classmates and instructor. An ideal situation is to have areas that can accommodate both small and large groups.

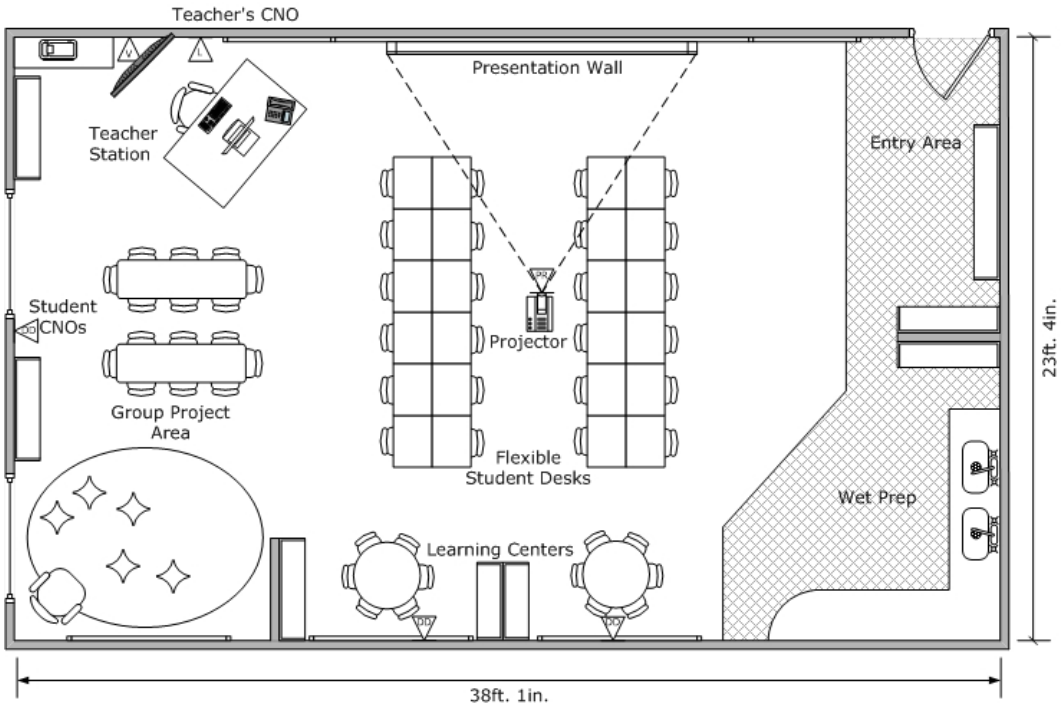
The front presentation wall serves to allow for presentation to the entire classroom while a smaller area located in the rear of the classroom will allow for smaller presentations and practice space. This area should include general space to allow for different activities within a small group, electrical connectivity to power presentation devices and at a minimum be adjacent to network connectivity to allow access to stored information.

- *Student Data Connectivity*

Student Data Connectivity locations should be provided via a combination of hard-wired and wireless topology. Elementary classrooms should have at least six (6) hard-wired student data outlets provided through double, triple or quad CNO's. These CNOs and all other data outlets in the classroom should provide connectivity to the building-wide data network, which, in turn, has connectivity to the school Department's wide-area network and Internet service provider. In addition, a single data drop dedicated for a wireless access point should be included in the infrastructure design. The access point should be mounted high on the wall our of harms way or above the drop ceiling out of sight.

- *Typical Elementary Classroom Layout*

The following sample elementary classroom layout illustrates the implementation of technology components described above.



3.6 Typical Middle / High School Classroom Layout Design

The integration of technology into the middle/high school classroom requires basic components that support several "design drivers" that differ from elementary school classrooms:

- Individual student tables allowing for flexibility in use from traditional rows to perimeter peninsula arrangements of 4-6 students for team projects and collaboration,
- Flexible technology friendly furniture with an emphasis on student tables rather than chairs so technology equipment can be allocated per student if necessary,
- Standardized classroom layout which allows for more customization based on the learning activities that will take place in that space over time, and
- Indirect and controllable lighting where appropriate to allow effective use of presentation components.

Individual technology friendly student tables will allow for flexibility in use from traditional rows to perimeter peninsula arrangements of 4-6 students for team projects and collaboration. Decisions on selecting equipment and furniture will also depend on:

- Whether or not it is a new facility, a modernization or a renovation
- The specific curriculum anticipated for that space
- The number of participants estimated for that space

The basic middle/high school classroom technology components consist of the teaching station, technology cluster, and student connectivity locations.

- *Teaching Station*

Connectivity for the instructor's station should be located off center in front of the classroom, adjacent to a white dustless marker board (or electronic whiteboard in selected classrooms) and pull-down screen. A high/low AV Harness will allow for presentation capability to a ceiling mounted LCD projector and/or video monitor. The station should include sufficient data connectivity for the instructor to connect a laptop, printer and other peripheral device if necessary. A voice outlet is included for a telephone that should be located on the teacher's desk. The instructor's desk should be free standing to allow for reconfiguration of the space if need be. The front row of ceiling lights should be capable of being dimmed and controlled separately from the reminder of the lights in the learning space to allow for maximum contrast of images on the pull down screen.

- *Technology Cluster*

An area should be located in each middle and high school classroom to accommodate technology centric learning activities. This space should have a minimum of 6 hardwired drops for connectivity of both dedicated computing devices and/or peripheral equipment associated with the learning process. It may be convenient to locate this space in the rear corner of the classroom to allow it to stretch along a sidewall, back wall or both if desired.

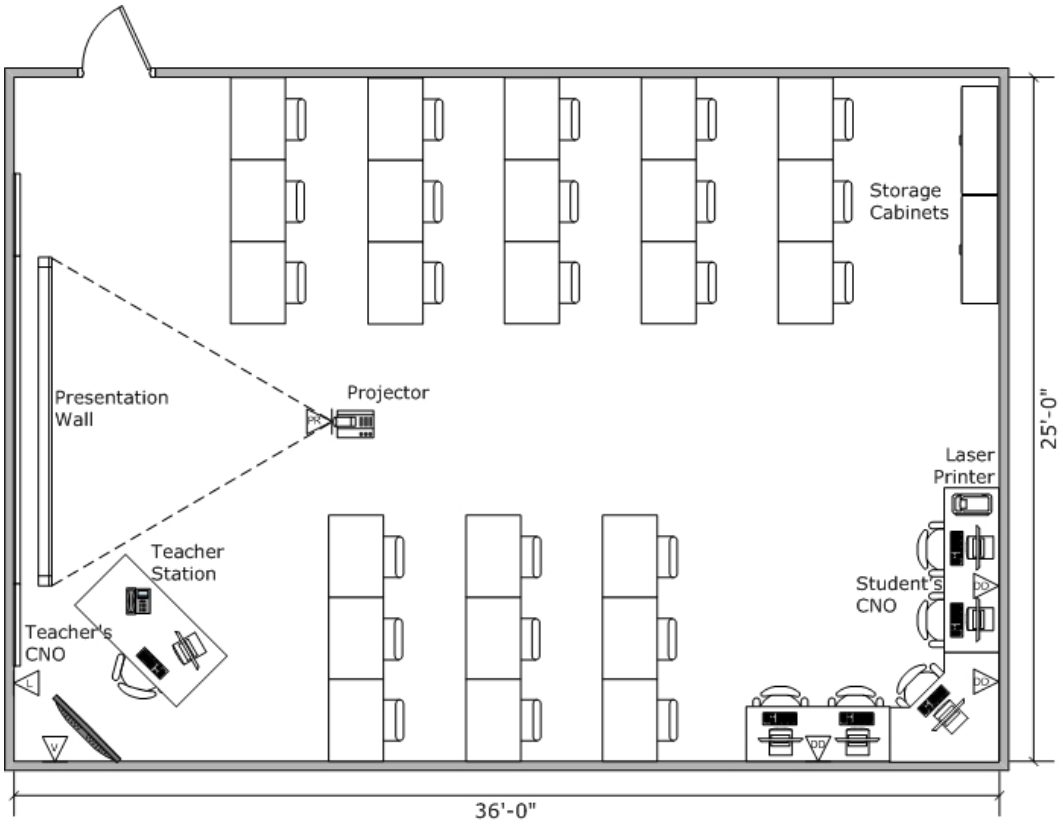
The Technology Cluster should allow for groups of 2-6 students to collaborate and function as a team. As such, technology friendly tables should be used to accommodate the anticipated equipment and associated cabling necessary in a hardwired environment. It is recommended that computing devices with as small a footprint as possible be utilized to allow for maximum work space for each student.

- *Student Data Connectivity*

Data connectivity for the typical middle/high school classroom should come from both wired and wireless access. While it would be prohibitively expensive to provide hardwired drops for an anticipated class size of 24-28 students, an access point will allow for a flexible and cost effective means of providing data connectivity when necessary. A dedicated hardwired drop should be allocated above the drop ceiling or mounted high on the wall to minimize tampering. The access point should be mounted in a secure manner, either in an appropriate enclosure or above the drop ceiling out or sight. The data cable serving the access point should be connected to a network switch that delivers power over Ethernet or to a cable with an inline power injector. Students will be able to effectively "share" the bandwidth provided by the access point for normal connectivity needs while still having flexibility to arrange the furniture within the space according to activity. The hardwired drops located within the technology cluster will serve for group exercises and activities requiring higher bandwidth needs.

- *Typical Middle / High School Layout*

The following sample middle/high School classroom layout illustrates the implementation of technology components described above.



3.7 Typical Computer Lab Layout Design

The technology infrastructure for computer labs must be tailored to the specific activities associated with a 1 to 1 student computer environment. A robust technology infrastructure will be accompanied by an electrical infrastructure that will allow for uninterrupted connectivity. A number of other key elements are also crucial for this space to function in an efficient manner. They are:

- Lighting that is controllable locally,
- HVAC elements that can sufficiently cool the space and not add additional background noise, and
- Technology friendly furniture to accommodate the necessary cables and equipment.

It may be beneficial to implement a small number of computer labs that utilize a Telecommunications Enclosure rather than be connected through hardwired drops to a Telecommunications Room. Including a telecommunications enclosure within the space for data connectivity will allow for easier isolation of the drops within the space if a networking curriculum is involved. The switch serving the drops in that space could be disconnected from the building-wide LAN and used as test bed for students with the instructor's supervision.

The computer lab design should incorporate a teaching station, a peripheral cluster, and the student connectivity locations at a minimum.

- *Teaching Station*

Connectivity to the instructor's station should be located off center in front of the classroom, adjacent to a white dustless marker board (or electronic whiteboard in selected classrooms) and pull-down screen. A high/low AV Harness will allow for presentation capability to a ceiling mounted LCD projector and/or video monitor. The station should include sufficient data connectivity for the instructor to connect a laptop, printer and other peripheral device if necessary. If desired, monitoring software loaded on the instructor's computing device could be added that allows for monitoring of the student computing devices.

The teaching station should have a voice outlet to allow for telephone connectivity from the teacher's location, away from the student areas of the classroom. A free-standing instructor's desk should be included to allow for minor rearrangement of the instructor's station based on personal teaching style. The front row of ceiling lights should be capable of being dimmed and controlled separately from the reminder of the lights in the learning space to allow for maximum contrast of images on the pull down screen.

- *Peripheral Cluster*

The peripheral cluster should serve as an area where printing, plotting, scanning and document production equipment could be stored and used. Typically, this area will be located at the back of the classroom, out of the way of instructional activities so students are not distracted during teaching sessions. It should included a minimum of 2 hardwired data drops, equipment and supply storage, peripheral device table space and some space to allow for document production. As this space will most likely by used by all the students in a given class, it should be accessible by multiple people at the same time and should not be crowded of placed at the end of an aisle.

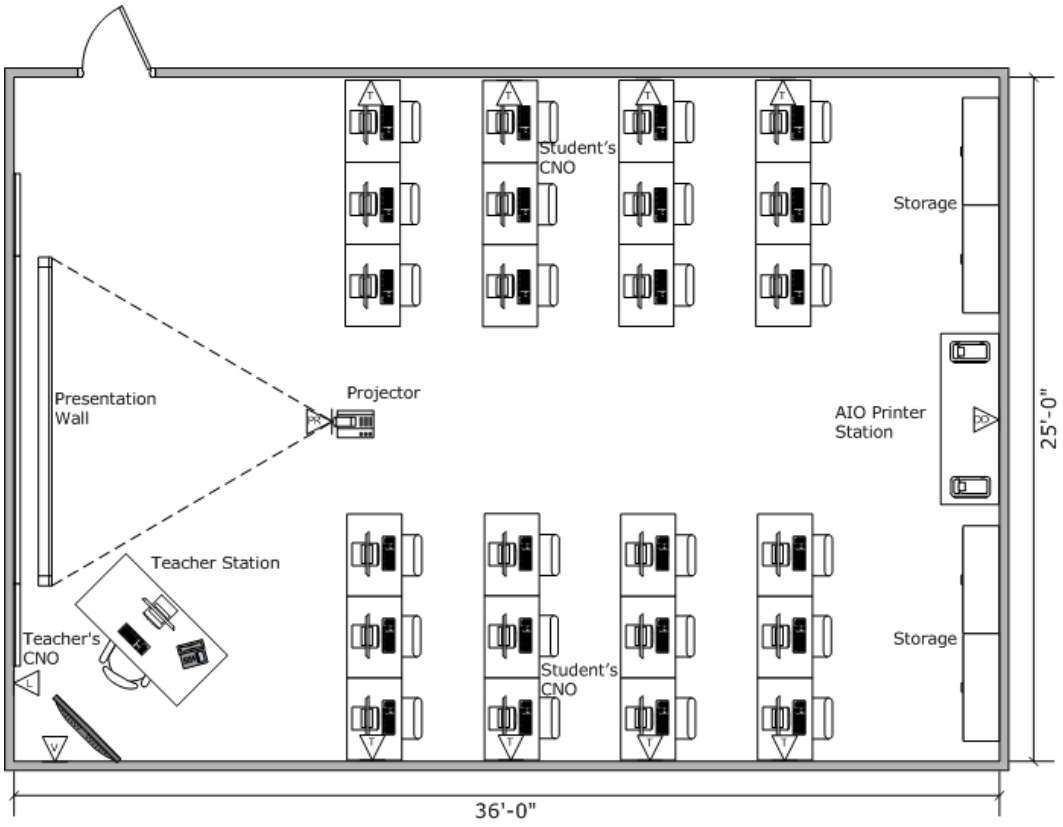
- *Student Data Connectivity*

Data connectivity within the computer lab should come from mainly from hardwired data drops and be supplemented by wireless access. Since the overwhelming majority of instruction and work done in this space will be computer based, hardwired drops will allow for the allocation of sufficient bandwidth to each computing device. A minimum of 24 hardwired student drops should be included in three or four rows of data drops on opposite facing side walls of the classroom. The exact number and arrangement of drops should be based on the dimension of the room and anticipated student population. A dedicated wireless access data drop should be included to supplement the hardwired data connectivity in the event that additional devices need to be connected to the network. This drop should be mounted near the ceiling or above the drop ceiling to minimize tampering.

Flexible, technology friendly furniture must be included to accommodate the patch cables and power cords associated with this amount of computing technology. The layout described above will allow for desks to be arranged in rows, peninsulas or a U-shaped configuration based on curriculum and teaching style. The furniture should allow for the location of a computing device and still leave some table-top space for student materials such as books or paper.

- *Typical Computer Lab Layout*

The following sample computer lab layout illustrates the implementation of technology components described above.



3.8 Typical Science Lab Layout Design

The science lab design should incorporate a teaching station, student instructional area, and student lab stations at a minimum.

- *Teaching Station*

The connectivity to the instructor's station should be located on the presentation wall of the room and be located off center to allow students to view the screen or whiteboard while the instructor is presenting to the class. The station should be fixed and include plumbing, gas, power and data infrastructure components. Knee space should be incorporated under the station so a chair or stool may be used by the instructor. Some amount of storage should also be included to house computing equipment, lab equipment and general lab supplies. Additionally, the station should have table top space for demonstration experiments, computing equipment and/or documents and include a sink for wet prep.

The data infrastructure will include an AV Harness that includes hardwired drops mounted in the instructor's side of the station connected to high mounted video outlets and ceiling mounted data and video outlets. Electrical power should be associated with the AV harness in a sufficient amount to power computing devices, projectors and lab equipment. The station must also have connectivity for a telephone handset that can be used by the instructor.

- *Student Instructional Area*

The Student Instruction Area should be located centrally within the space to allow all students to have direct visual contact with the instructor during lecture portions of the class. This area should have desks allocated for the proper number of students and that can be rearranged in the event a different configuration is necessary. It is preferable to have tables rather than desks so students may work in teams while still having desk space to work.

A dedicated wireless access drop should be included as part of the AV Harness to provide data connectivity for computing devices that may be located in the student instructional area, away from hardwired drops. This drop should be located above the drop ceiling and/or mounted in a protective enclosure on a wall within the room.

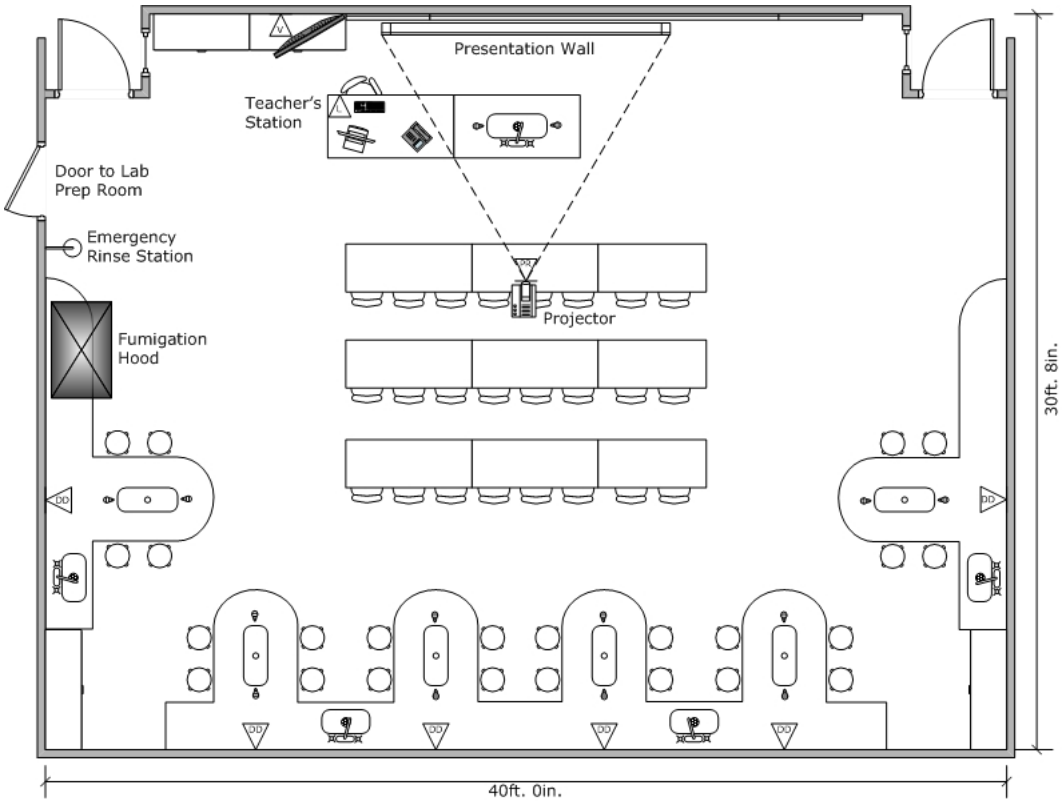
- *Student Lab Stations*

The rear and/or sides of the science lab should include the student lab stations. These stations will be permanently built-in and include plumbing, gas, power and data infrastructure components. Knee space should be incorporated under the stations for chairs or stools used by the students as they conduct hands on experiments. Storage should also be included to house computing equipment, lab equipment and general lab supplies. Additionally, the stations should have table top space to demonstrate experiments, room for computing equipment and/or documents and include a sink for wet prep. A minimum of 6 stations should be included with consideration given to double-sided stations allowing for smaller groups to work independently.

The data infrastructure should include at least 2 data drops at each station with the possibility of installing 4 data drops at each station for greater connectivity. Sufficient electrical power should be associated with the station to power computing devices, probes and lab equipment. The station will also include sink space and free work space to conduct and monitor experiments.

- *Typical Science Lab Layout*

The following sample science lab layout illustrates the implementation of technology components described above.


Presentation Wall
Teacher's Station
Door to Lab Prep Room
Emergency Rinse Station
Fumigation Hood
Projector
30ft. 8in.
40ft. 0in.

Chapter 4
Technology Systems Design

Central Premise of Technology Plan

Significant and continuing improvement in student achievement requires:

- **A major paradigm shift creating a new classroom Teaching and Learning Model where;**
  - The teachers' role changes from predominately lecture to that of a facilitator, mentor, and manger of instruction;
  - Students become active participates in a collaboration, project based, small group learning environment;
  - Students acquire critical thinking, problem solving, information analysis, and life long learning skills;
  - Parents and community are engaged; and where
- **The new Teaching and Learning Model is effectively supported by an infusion of ubiquitous classroom technology.**

This Chapter contributes to the Central Premise by:

- defining communications infrastructure requirement
- providing technology equipment requirements
- defining technology and security system requirements

Chapter 4 Technology Systems Design

The following systems are major components of the Providence School Department's IT capabilities. To date, the concentration has rested upon the data network, but going forward, support for the telephone, video and security systems must be provided to fulfill the commitment to a new Teaching and Learning Model. As the trend in telecommunications continues to move towards a converged network, the systems and infrastructure in place in Providence must support migration and consolidation.

4.1 Structured Cabling Component

A structured cabling system hopes to maximize return on cabling investment by securely installing a cabling system and pathways that exist independent of the electronics that drive the specific technologies. The intent is for the cabling system to have a realistic usable life of 15 to 20 years, as opposed to most electronics' usable life spanning just 5 years.

- *Backbone Cabling*

All backbone cables shall run from the TER to individual TRs and terminate in the appropriate cross-connect field. Analog telephone backbone cabling (Category 5e 25-pair UTP cable) should terminate in a 110-block mounted on a fire resistant plywood sheet securely mounted to the wall, both in the TER and at the destination TR. Data backbone cabling (hybrid 12-strand multimode and 6-strand single mode OFNR fiber optic cable) should be terminated in rack-mounted fiber optic patch panels. All fiber optic cable should terminate into SC-type connectors. Appropriate SC-to-XX patch cords should be specified for the active electronics specified.

Fiber optic cable should be protected from casual damage by enclosing the cable in inner duct or specifying armored cable. Backbone cabling should be placed in conduit systems running back to the TER, with care to use appropriate bend radii. A significant amount of slack should be left in the cables before they are terminated to allow for reconfiguration of the room. Over the course of 15-20 years, it is probable that cabling will be moved at least once.

- *Horizontal Cabling*

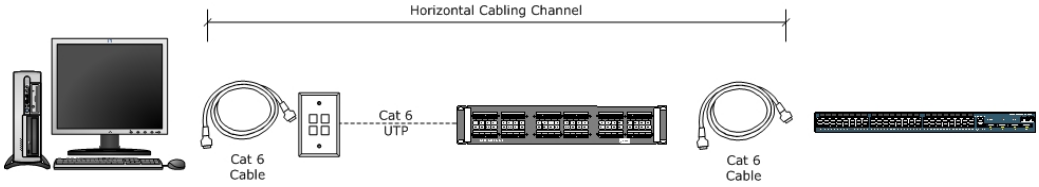
All cabling used in the horizontal shall conform to physical and performance requirements of the current ANSI/TIA/EIA cabling specifications. Cabling shall run from the workstation back to a patch panel in the appropriate telecommunication room, without intermediate connection. The only exception to this is where a consolidation point is necessary. All horizontal cabling media shall be the same category to add flexibility to the cable plant so that data and voice cables are interchangeable in usage, with a simple reconfiguration in the TR.

Any new cabling should be rated category 6 or above. Again, looking forward several years, having the ability to run Gigabit Ethernet will be necessary for many multimedia applications. Cable should be installed with careful attention to bend radii, crosstalk and other installation mistakes that could wear the cable down over time.

- *Channel Warranty*

The horizontal cable channel (from equipment cable at the workstation to the patch cord at the horizontal cross-connect) shall be installed with a channel warranty of a minimum 15 years. This shall include guaranteed system performance at a minimum of the installed rating. In this case, Category 6 performance must be demonstrated. As such, the contractor must test and document all cabling and terminal hardware for Category 6 performance, and if any component shall fail to meet Category 6 standards within the warranted period, contractor will replace the deficient component at no additional cost to the school system.

Standards-based installation practices must be observed in the installation of cabling, to ensure system performance over the life of the application. Designers should ensure proper installation procedures, similar to methods explained in BICSI Telecommunications Distribution Methods Manual (TDMM) are utilized.

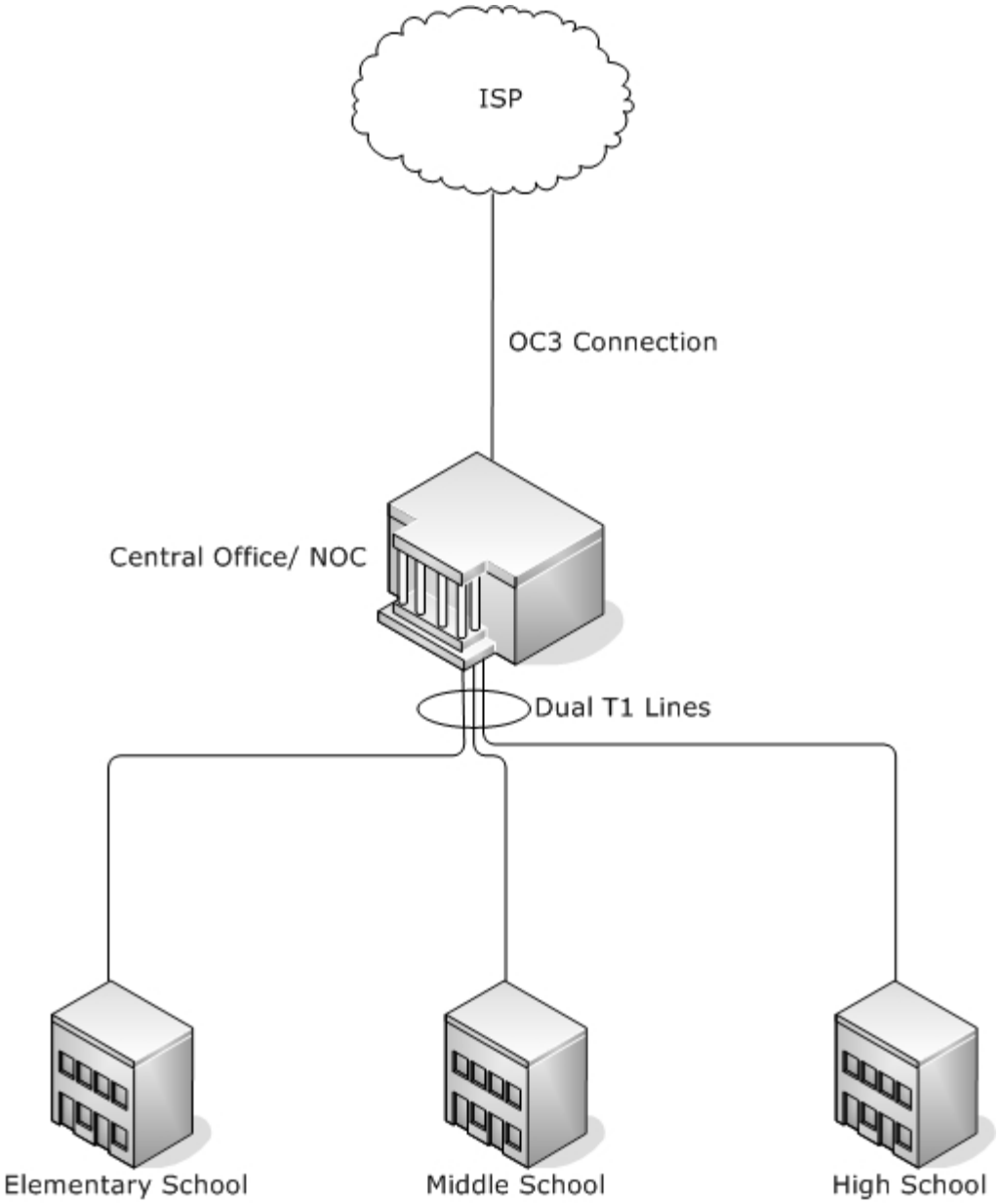


- *Administration*

Designers should follow the requirements of TIA/EIA-606A to fully provide the Providence School Department with documentation clearly identifying completed IT construction. Telecommunications spaces, hardware, and equipment should be permanently labeled. Cables and outlets should also be labeled with a unique identification scheme for each individual cable link. Patch cords, patch panels and equipment racks should also be uniquely identified. Access Panels for accessing telecommunications equipment in the ceiling should be uniquely identified on record drawings and labeled accordingly. All labeling information shall be maintained to reflect as-built and changes documentation. All test documents shall reflect the building's labeling scheme.

4.2 LAN / WAN Architecture and Network Electronics

Providence's existing WAN distribution runs over the department's Internet Service Provider (ISP), utilizing ATM protocol technology. The Central Office is connected to the ISP by an OC3. The other facilities in the department are connected by dual T1 lines, single T1 lines, DSL, or Dialup. Each school's LAN is currently on an internal 10/100Mb Ethernet network. All future facilities should be upgraded to a T1 connection to the ISP, at the minimum. A fiber ring would be ideal if any streaming video or distance learning is to be implemented into the department's educational program.

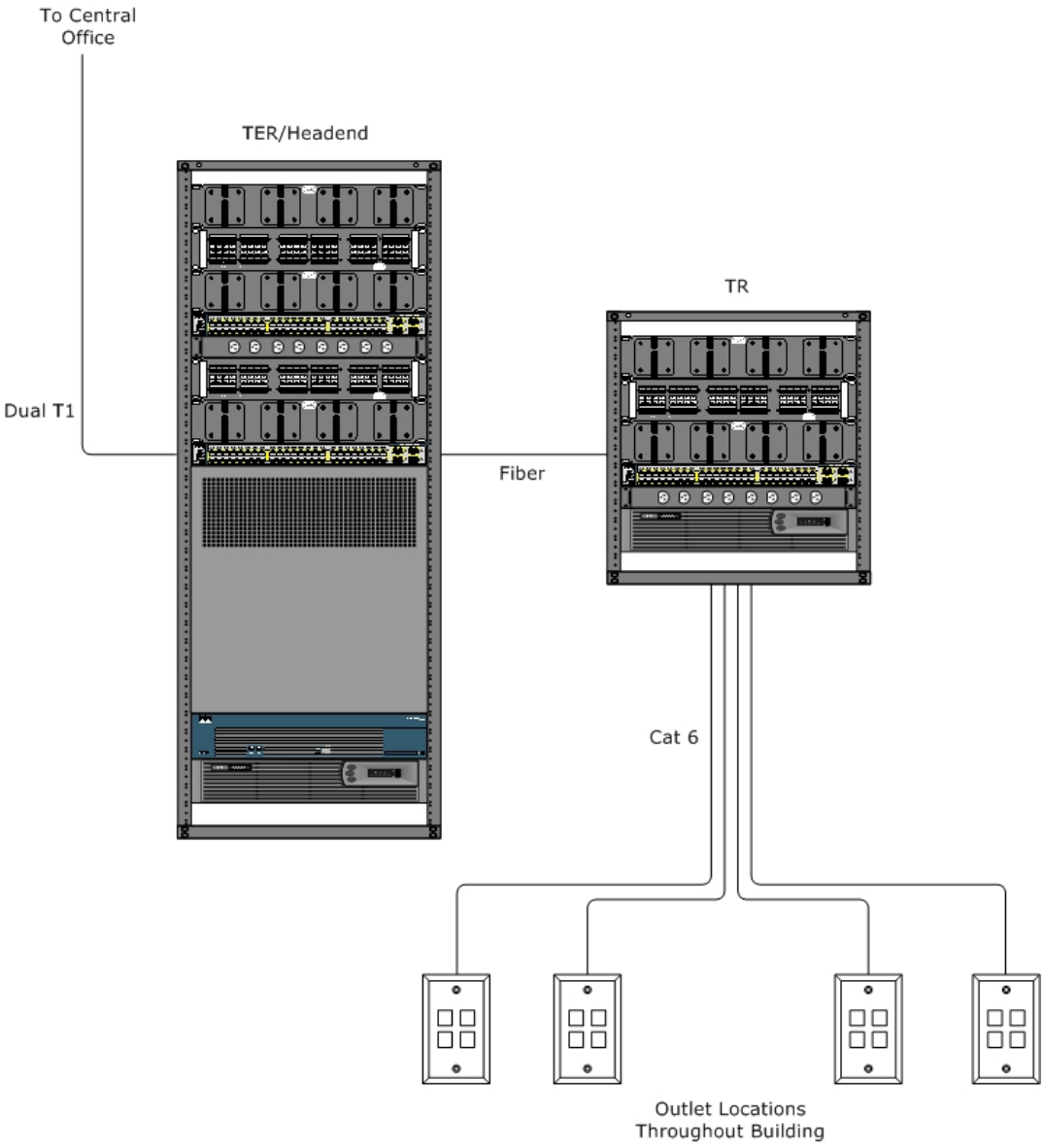


The Central Office or Network Operation Center (NOC) and other facilities, are currently run primarily by Cisco hardware. Our recommendation is to standardize all network hardware to one manufacturer, in order to ease network administration. All facility core switches in the network should support ATM, Gigabit Ethernet and 10/100 Mb Ethernet technology and be able to employ Layer 3 routing. The core switches should be modular and upgradeable for the changing network environment.

Workstations should be connected by UTP based 10/100/Gigabit Ethernet switches (stackable or chassis-based). Switches shall have Quality of Service (QoS) capability to support voice, video and data IP transmissions. Suitable existing equipment may be relocated and re-configured. Redundancy and security should be built into all elements of the network design, including redundant power supplies. The backbone cabling within the school shall be a hybrid fiber optic cable (12/6), run between active electronics. This media will give the facility the ability to support voice, video and data IP transmissions. The NOC central switch should be sized for existing facility

renovation of all classrooms, administration offices, common areas, and for additional facilities that may come online in the future.

Designers should consult directly with the Department to ensure the most current equipment is specified.



- *Network Security*

A firewall device is recommended for the network. This device should be located in the headend network rack, and be connected to the incoming intern feed to protect the data network resources. The firewall should provide IP Security and Virtual Private Networking (VPN) capabilities, offer Gigabit throughput and offer the ability to handle multiple concurrent connections and IPsec Triple DES Encryption Standards with speeds up to 100 Mbps, resulting in true carrier-class performance. This device must

offer redundancy or an identical device must reside with the firewall. The firewall must have current, upgradeable operating system.

All other network security software for PC servers and desktops should be determined by each school as it comes online. The particulars of client software packages are not covered under the scope of this document.

- *Wireless LAN*

Each building should have a wired infrastructure to install wireless access points (WAPs), in order to fully cover the school with WLAN connectivity. Care should be taken to implement a security solution to minimize bleed over into the exterior of each building, and to ensure encryption and control access into the building computer network from roaming users.

In order to ensure that WAPs are able to be located where necessary once the site has been turned over to the school, many data jacks should be installed to allow flexibility in the wireless network design. Obstacles that may not be reflected on architectural drawings will interfere with wireless reception, and so, at a minimum, all classrooms, office suites, corridors, and common areas should have a minimum of 1 data drop aimed at servicing a wireless AP. Large open areas such as the cafeteria, gymnasium and media center should have multiple drops for wireless applications. Drops intended for wireless should be located near the ceiling to promote better signal reception once WAPs are activated.

Power for the WAPs may be provided through Power over Ethernet equipment, or a 110-volt receptacle may be collocated at each data drop intended for wireless usage. It is important also to specify a typical location in each classroom where a laptop cart (for up to 24 laptops) may be stored, as well as providing space within each facility for a charging station for extra battery packs for laptops.

4.3 Student Information System

- *Information Management*

Department leadership has expressed the need for planning and decision making to be more data driven. School administrators and Central Office personnel feel strongly that numerous administrative applications and data sources need to be developed or upgraded.

The Department would like better access and timelier management information to improve decision making. Although the information generally exists, the Department does not have the ability to assemble information easily from its functional databases for tactical and strategic decisions in a timely fashion to support effective decision-making. There is a need for a decision support system that can track education costs for certain kinds of students and perform specific analyses.

Administrators and support staff have often complained about the need to submit paper copies of requests and information for administrative tasks. Many suggested creating and implementing electronic templates for submitting requests and responses for information. Much information is available both electronically and on paper from both the Department and in schools, and a great deal of it still flows on hard copy reports. There is a duplication of effort for data entry for reporting purposes. Purpose specific computers exist that do not allow the exchange of information with other systems.

- *Decision Support*

As stated in the Superintendent's framework for reforming Providence Schools, Rekindling the Dream, the Department has made it a priority to "Increase student achievement through a consistent and comprehensive focus on teaching and learning". The Providence School Department relies entirely on a custom student information system, REG 2000 (REG), for managing its student data. An outsourced company, Firm Solutions, developed REG 2000.

Firm Solutions maintains REG 2000 and is currently upgrading the product. There are over 300 users of REG 2000, including the attendance clerk in each school as well as some guidance counselors. However, REG 2000 is not yet available to the teaching staff. A major restriction for access to REG 2000 is the limited number of workstations that have access to the application since it runs over a dedicated ISDN network that is only connected to administrative offices. Principals, guidance counselors, and administrators are seeking simpler, user-friendly query tools to access and interpret important data from REG 2000. Department leadership has expressed the need for planning and decision making to be more research and data driven. REG 2000 has a valuable, long-term store of student data. Because of its unique nature and the need for more customization than other school departments in the state, the Providence School Department has been selected as a pilot site for testing a new data query system (Cognos) being developed by the Rhode Island Department of Education. PSD staff members do not have the ability to assemble information easily from REG 2000 for timely strategic decision-making.

- *Student Information System*

A student information system (REG 2000) is in place and is supported throughout the administration. Some administrators question the entry accuracy of data within the REG 2000 system. The Department chose to develop its own student information system after evaluating numerous commercial packages that did not meet requirements for the large migration of students with specific transportation needs. REG 2000 was originally developed for tracking student records and attendance. New modules such as transportation, scheduling, health records, test history, discipline and special education tracking have been added.

4.4 Telephone System

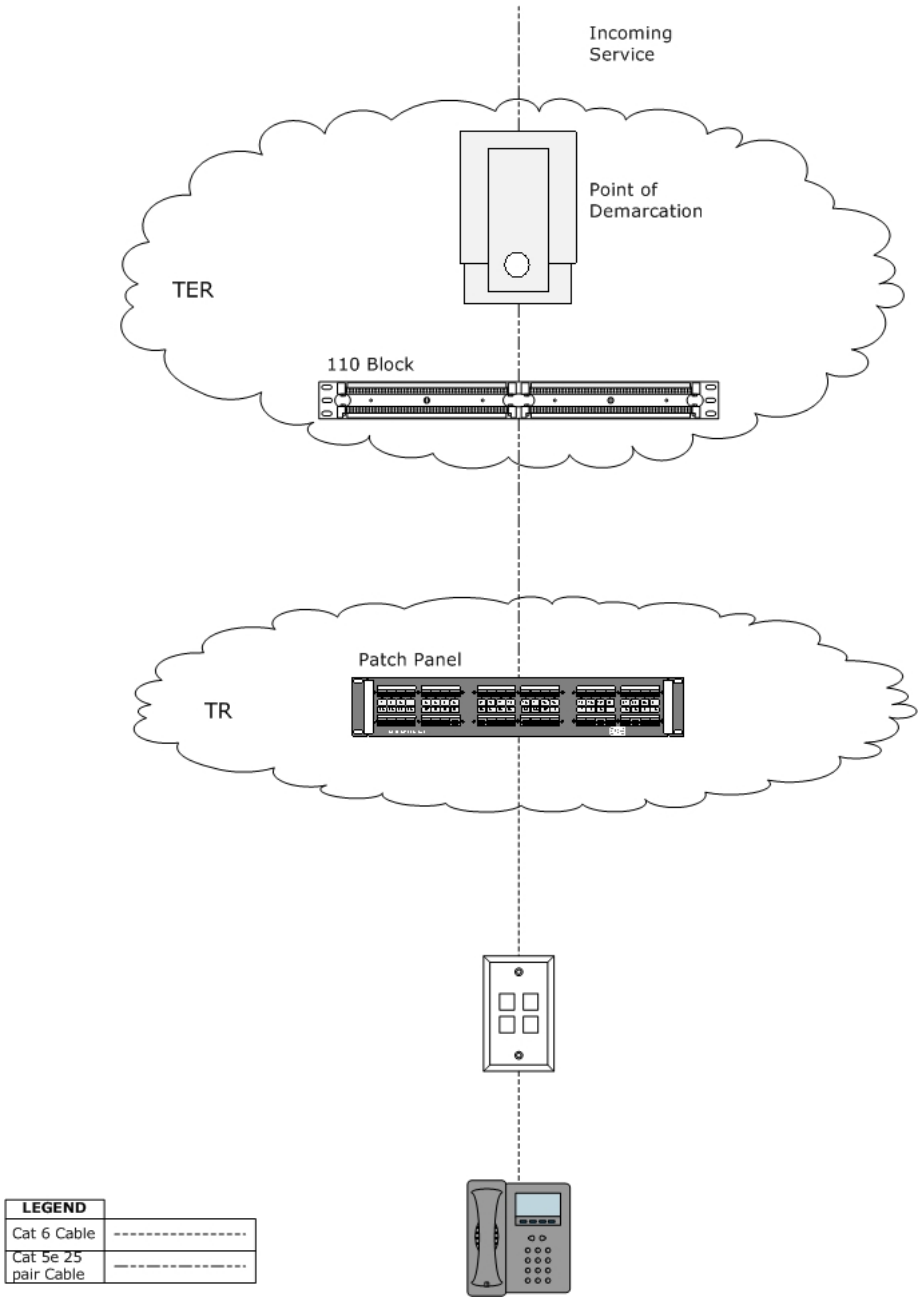
The Providence School Department shall continue to utilize a Centrex based system that is administered and managed by the local service provider. Since funding is provided in part through E-rate and there are no plans to add additional staff to manage an internal telephone system a Centrex system meets the current needs while still allowing for an infrastructure that can be easily migrated to support other voice systems when the Providence School Department decides to make that transition.

Multi-pair lines shall be brought to the point of demarcation by the service provider for each facility. The exact number of lines will be facility dependant and should be determined with Providence School Department personnel. From the point of demarcation, enhanced category 5e multi-pair tie cables shall be distributed to the Telecommunications Equipment Room and Telecommunications Rooms where they will be terminated in rack mounted patch panels. Category 6 UTP cables shall then be used to deliver service to individual telephone outlets located throughout the facility.

The telephone system should interconnect to the intercom/PA system at each facility. Additionally, miscellaneous lines for fire alarm, security, building control, elevators and other analog devices will be brought to the point of demarcation in each facility and connected as necessary. The Centrex lines must allow for 911 services from all handsets. User handsets shall differ by room type. Administrative handsets shall be multi-line, handsets while classroom handsets shall be single-line devices, both shall be supplied with associated cables to connect to wall jacks.

A long distance account with the service provider should be maintained and should be coordinated through the main telephony contact within the department for management purposes. In addition, a voicemail system with dedicated numbers should be utilized to allow posting of pertinent and important messages for parents and students of the department. The telephone system for existing, new and renovated facilities shall meet the following features:

- ❑ Telephony industry standards based platform
- ❑ Capability to connect to multiple types of incoming service (multi-pair cables, T1)
- ❑ Capability to connect to centralized telephone service
- ❑ Automatic call routing configured for maximum efficiency and cost savings to the department
- ❑ Capability to interconnect with 911 emergency services from any handset
- ❑ Call logging, tracing and caller ID for all devices provided from the service provider
- ❑ 4-digit dialing throughout the department
- ❑ Handsets located in all classrooms and administrative areas
- ❑ Capability to interconnect with separate dedicated incoming analog lines for fire, security and emergency situations
- ❑ Full compatibility and interconnectivity to building wide intercom and public address systems
- ❑ Fully programmable auto attendant features
- ❑ Voicemail and messaging capabilities for users
- ❑ Programmable restriction levels for each handset
- ❑ Scalability to accommodate the departments future telephony needs



4.5 Intercom and Master Clock Systems

The intercommunication system shall be a low voltage system that utilizes a copper cable infrastructure to distribute a user-defined input in a single or bi-directional manner. The system shall be capable of multiple, simultaneous conversations on separate channels throughout the facility through telephones, call-in switches and loudspeaker assemblies.

A separate programmable master clock with correction of secondary clocks shall also be included. The master clock system will control tone generation in order to signal class changes. The systems shall be microprocessor based and be fully compatible with the telephone system installed within the facility. In addition, the system must

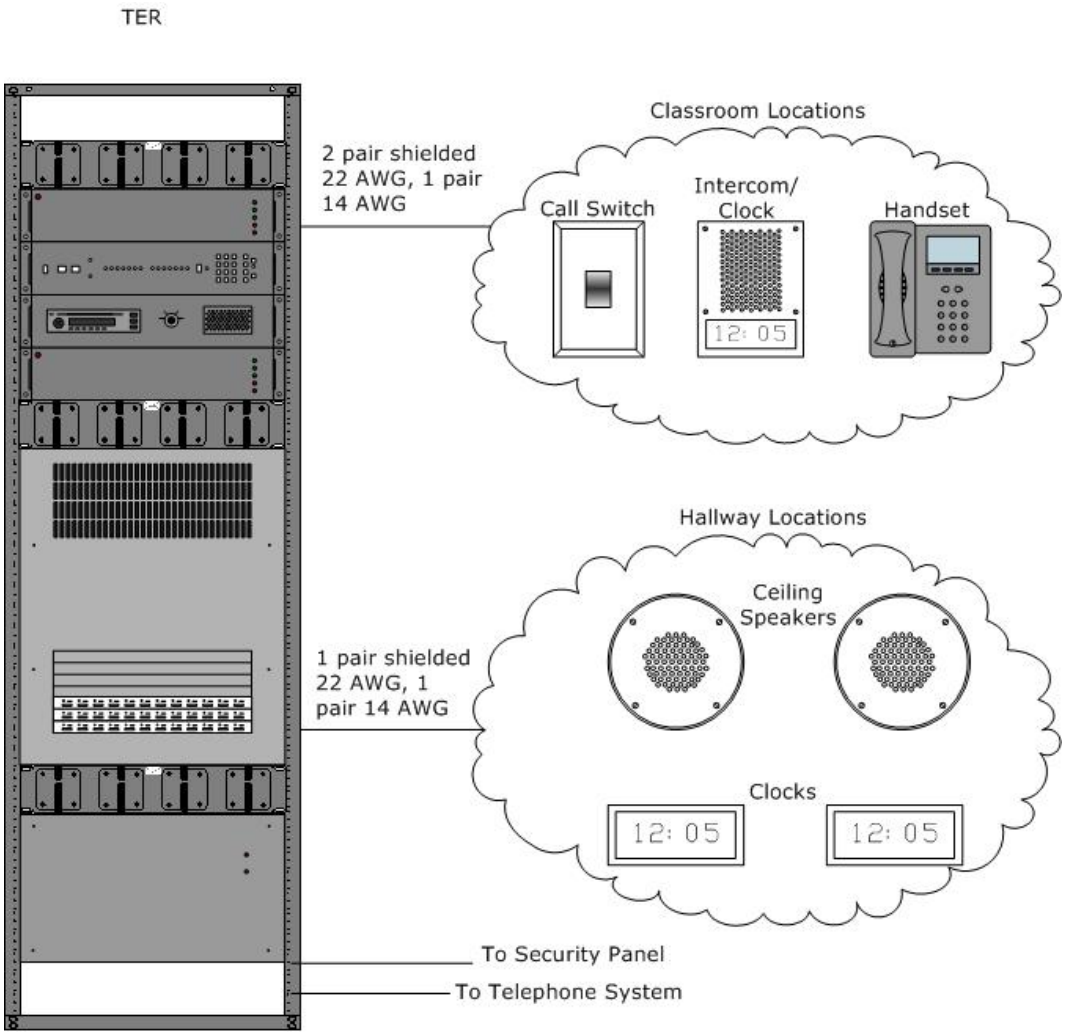
be expandable to meet the user's future expansion needs and be programmable from a computer terminal located at the facility. The bulk of head end equipment should be located in the Telecommunications Equipment Room (TER) with only calling and monitoring devices located in the main office location.

Clock assemblies should be located above classroom doorways, or any other approved location within the room. In certain architectural situations it may be convenient to locate the clock and speaker in a single wall-mounted assembly. If this is not the case, ceiling mounted classroom speakers separate from the clock should allow for hands free two-way communication with interruption through either a call-in switch or intercom telephone. Ceiling mounted corridor speakers and wall mounted clocks should be spaced appropriately to allow easy viewing of clocks and full audio coverage of pages throughout the facility.

The system should be PC based to allow for easy programming and system control. Additionally, administrative handsets must be included in multiple locations to allow for simple control and management of the system. The system shall be capable of multiple schedules, multiple zones and holiday schedules.

The facility intercommunication system shall be capable of meeting the following requirements:

- ❑ Capability to fully interconnect with the facility telephone system
- ❑ Announcement distribution from a central location to zones, individual classrooms, groups or all facility speakers
- ❑ Broadcast of user defined input (radio signal, compact disc, aux input, etc.) to zones, individual rooms, groups or all facility loudspeakers
- ❑ Emergency cut-in to all speakers in an emergency situation from a central location, including auxiliary sound systems
- ❑ Two-way intercommunication between the central rack, any call-in location or any selected speaker location
- ❑ Hands free communications by means of a loudspeaker used as a transducer or speaker/microphone combination
- ❑ Visual and audio monitoring of all intercommunication system activity from a central location
- ❑ Volume and level controls for all centrally located intercommunication system equipment
- ❑ Capability to tie into any auxiliary sound system throughout the facility
- ❑ High priority call-in from any telephone/call-in switch in and emergency situation



4.6 Video Distribution Systems

The purpose for Providence's Video Distribution System is to offer video content to learning environments throughout the facility. The system will allow the viewing of external educational programming from a local cable provider. Internal broadcasting and video distribution will also be possible through video distribution equipment within the school. The broadband coaxial video distribution system should operate over the 5 to 750 MHz channel. The network design should use 750 to 1000 MHz CATV equipment and installation techniques.

All Communications circuits should be full duplex without the use of multiple cables. All video communication network outlets (CNO's) will have the capability of sending a video signal in the "reverse" direction to the head-end and receive a video signal in the "forward" direction from the head-end. This Video Distribution System will allow distribution of outside programming to all video CNO's, and allow for camera broadcasts internally and re-broadcast to other locations.

- ❑ Video distribution within the facility will be provided from any of these sources:
  - Cable Provider
  - Satellite

- DVD/VCR
- Cameras / Studio
- Digital Video Server

- ❑ The Video Distribution System will carry an analog signal on coax cable from the TER to a TR, which will then be sent out to the classrooms.

Equipment and cabling needed for a Bi-Directional Video Distribution System:

- ❑ RG-11 backbone cable runs from TER to TRs, and out to any splitters, combiners or tap in the corridors required for long runs.

- ❑ RG-6 Quad legs will run from splitters, combiners or taps directly to wall plates in the classroom.

Basic Head end Rack Equipment:

- ❑ Channel Eliminator Filter

- ❑ Agile Modulator

- ❑ Agile Demodulator

- ❑ Combiner

- ❑ Agile Heterodyne Processor

- ❑ Channelized Audio/Video Modulator

- ❑ Digital Video Storage Server

Three Channel Elimination Filters are to be installed in the video distribution head end rack for studio broadcasting by the school TV studio. During installation and setup, the department will provide the channel numbers which are to be eliminated to the contractor.

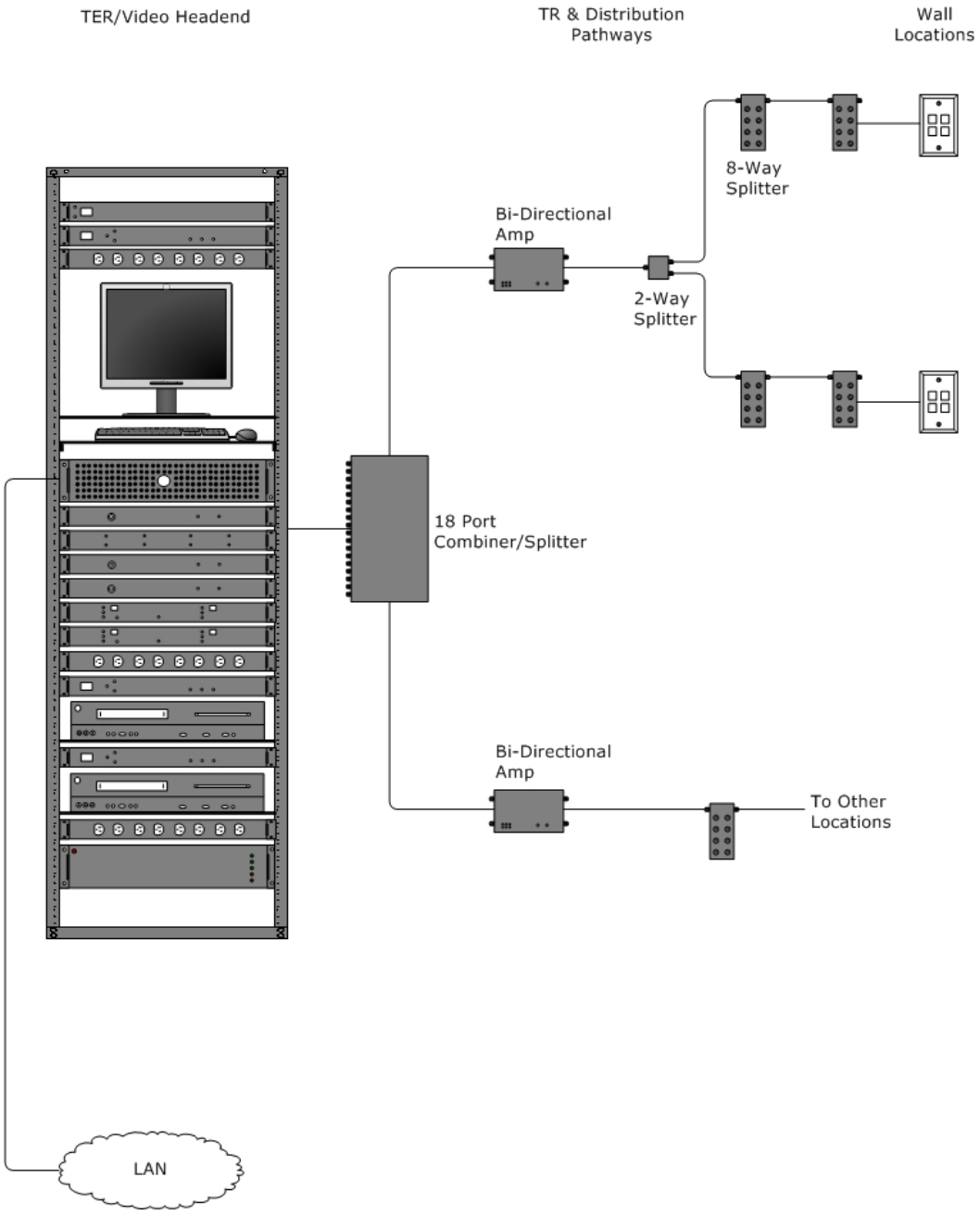
A Digital Video Server, capable of storing content in a digital video format for playback at anytime over the data network, will offer steaming video to the desktop and digital video storage for VHS, DVD, cable program and internal studio broadcasts. The digital video server will be capable of at least 4 independent simultaneous playbacks.

Video Conferencing is to be done through a video conferencing server or over an IP/TV solution. This form of video distribution is run primarily over the data network.
Physical Topology:

- ❑ Backbone cables coming from the TER or TRs should be supported above the racks and wallboards by ladder rack cable tray and pass through walls into corridors in conduit that are properly fire stopped. Within the corridors the backbone should be placed in wire trays. The backbone should enter the TR the same way it left the TER. All RG-11 originating from the TER or TRs will pass though a bi-directional amplifier.

- ❑ The RG-6 will come off the ceiling or wall mounted taps and use the wire trays where needed. The cable will then penetrate the corridor wall into the classroom using fire safe methods. All RG-6 Quad cables will be terminated in wall plates with F-Connectors.

- ❑ Splitters, Combiners and Taps will be used in the TER, TRs, closets or the ceilings space in the corridors as needed to distribute the cable to wall plates.



- *Electronic Bulletin Board*

The video distribution system will support an electronic bulletin board. This electronic bulletin board will allow the user to distribute essential information across the coaxial video distribution system to all or any TVs on a designated channel. The system can be used to post, morning / afternoon announcements, school events, cafeteria menus and emergency notifications. The channel will be one of the channels, predetermined by the school, to be allocated for internal use. This control unit is to be rack mounted with a monitor and keyboard in the video distribution system rack.

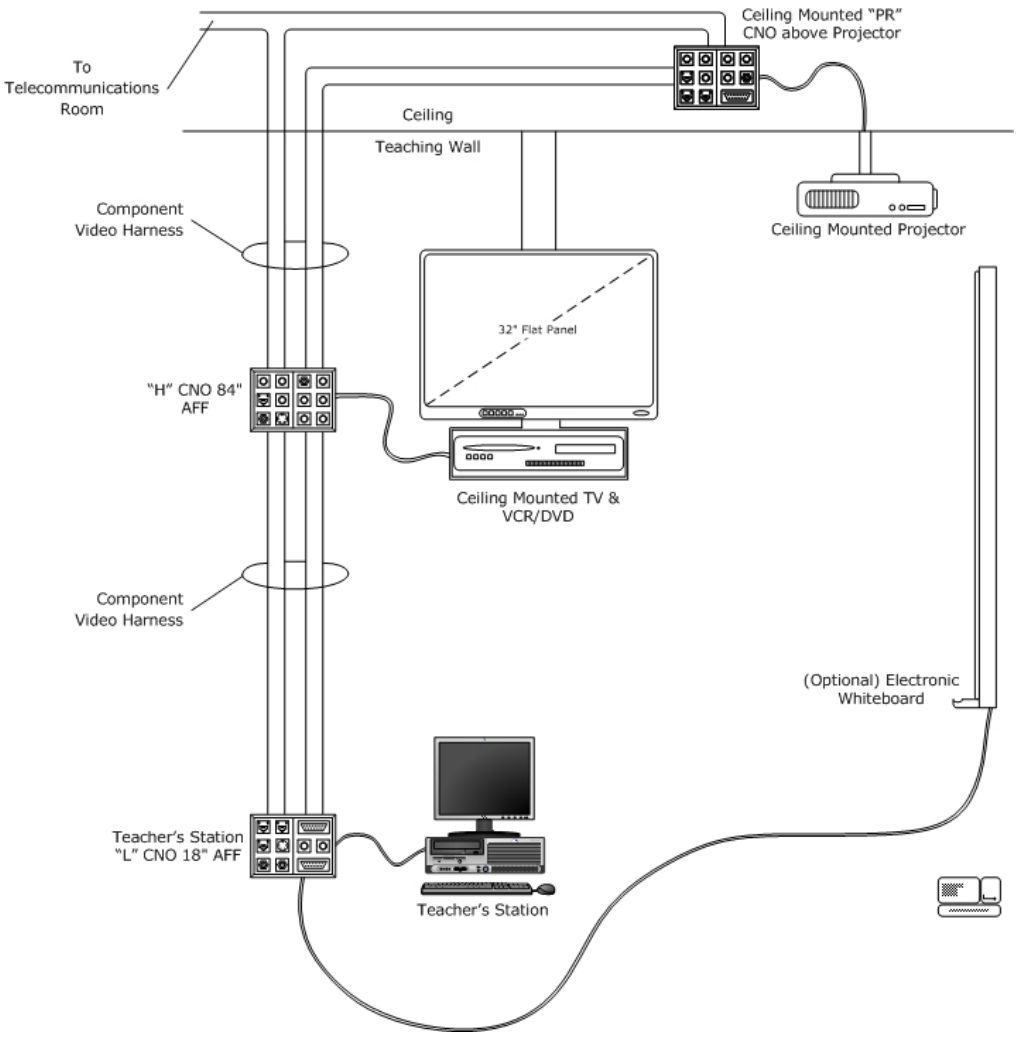
4.7 Audio Visual Projection Systems

Each classroom, computer lab and science lab will be equipped with the infrastructure for an audiovisual system. The systems selected within the new/renovated facilities will integrate monitor and/or projection capabilities from the teachers workstation to (1) a ceiling mounted LCD projector and/or a high mounted video monitor with VCR/DVD Combo, (2) electronic whiteboard, where present and (3) the video distribution system. The system will provide the following capabilities:

- Projection of an image from the teacher's computer to ceiling mounted LCD projector and/or monitor on a pull down screen or equivalent whiteboard.
- Distribution of audio and video signals from the high mounted VCR/DVD combo to the video monitor and/or ceiling mounted LCD projector.
- Distribution of the video signals from the school-wide video distribution system to the video monitor. This can include any video signal originating from the head end equipment in the TV studio such as live broadcasts from within the school, media distribution from centralized VCR/DVD's or a signal from the local cable provider.
- Electronic whiteboards to allow teachers to capture notes from classroom discussions, which have been written on the board, electronically. The teacher's notes can be saved and distributed to students on disk or over the network, and be printed out or distributed through E-mail.

Each computer lab, science lab and selected classrooms will be equipped with an electronic whiteboard with the following capabilities:

- Display Digital Applications while simultaneously accommodating handwritten notes and sketches
- PC or Macintosh Compatible
- Function as a dry erase board
- Active or Inactive whiteboard
- Interactive Projection Screen with low glare surface



4.8 Auxiliary Sound Systems

The facilities auxiliary sound systems shall be located and utilized in the specific areas they are defined to serve (gymnasium, cafeteria, cafetorium, auditorium, etc.) unless otherwise directed by the owner. The systems shall provide audio signal amplification, mixing and playback capabilities for large group presentations and gatherings.

The systems shall be rack mountable types with modular components in the event that equipment may be added or removed in the future. The systems shall consist of microphones, transmission media, amplifiers, equalizers, mixers and loudspeakers. The system shall have the capability to pick-up, amplify, distribute, record and reproduce voice and music in a clear and satisfactory manner within the space it is defined to serve. The auxiliary sound systems must be interconnected with the facility intercommunications systems and the intercommunications system shall have the ability to override the auxiliary sound systems for paging and emergency situations.

The facility auxiliary sound systems shall be capable of meeting the following requirements:

- ❑ Capability to interconnect with the facility intercommunications system
- ❑ Rack/Cabinet mountable, modular equipment

- Amplification, distribution, and recording of voice and music
- Capacity to be expanded through auxiliary inputs
- Capability to broadcast to hearing assistance devices
- Volume and level controls for all inputs and outputs
- Self-contained, stand-alone system with unique infrastructure independent of other facility systems

4.9 Classroom Sound Enhancement

The purpose of the sound enhancement system in classrooms and laboratories is the amplification of the teacher's voice to ensure all students hear equally, no matter where they are in the room. The system allows the teacher or student's voice to be amplified via either a collar or hand-held wireless infrared microphone. The system includes ceiling or wall mounted speakers that can also be integrated with other classroom equipment such as the LCD projector and VCR/DVD. The basic components of the sound enhancement system are:

- Wireless infrared collar microphone emitter with body pack transmitter
- Handheld transmitter/microphone
- Receiver/amplifier located in room adjacent to VCR/DVD equipment
- Dome Sensor located in ceiling attached to amplifier by plenum cable
- 4 ceiling or wall mounted speakers

The schematic diagram and classroom elevation that follows illustrates the functional relationship between the sound enhancement system and the various components of the audiovisual projection system.

4.10 Electronic Security Systems

Access control, intrusion detection and video surveillance systems shall be required for each new, renovated and existing facility to provide a high level of safety and security for the students, faculty and visitors. Additionally, the protection of the fixed assets is important to prevent the loss of educational materials and supplies that impact the quality of learning.

It is important that electronic security systems be compatible and capable of communicating with one another. The Providence School Department desires a network of systems in their schools that provide ease of use, ease of management and a single means of communications for security monitoring. All systems must be capable of signal transmission over TCP/IP protocols. Additionally, design coordination should include the security monitoring service that provides the Providence School Department with 24 hour monitoring. This will allow for a seamless level of security which will benefit both students and instructors.

Exterior security shall include fencing, window bars, electric locks, door entry buzzers, surveillance cameras, card access, proper lighting and include emergency call boxes. Interior security shall included surveillance cameras, glass break detectors, motion detectors, door contacts, electric locks, card access and call stations. The extent that these systems shall be integrated with one another shall be based upon the requirements of the Providence School Department for each school type.

The security systems shall be accessible and controllable within each school at designated locations and at the central monitoring service with which the department has a monitoring contract. Systems must be computer based and be capable of transmitting data over the department's WAN and/or POTS lines.

The Security System at each facility must have an emergency power backup system or be connected to an emergency generator. In addition, security panels, power supplies, controllers and communications devices shall be located within Telecommunications Rooms unless an acceptable location elsewhere is approved by Providence Schools. All cabling associated with the security systems must be installed in Electro Magnetic Tubing and dedicated only for that purpose.

- *Access Control*

The access control system shall be designed and implemented to control access to facilities and certain portions of facilities. The access control system will allow restriction levels based on individual's needs and shall be an easily programmable, computer based system that functions seamlessly across the department's facilities. A single card type should be standardized within the department to allow for easy management and control of personnel access levels. The access control system will be used to log and track users in the event an incident occurs and to prevent unlawful entry to facilities. The entrances, exits and secure portion of facilities shall have access controls, each based upon the requirements of each school type and location.

The primary means of access control for a facility will be by keypads and card access readers, designed for damage and tamper resistance, with a manual key alternative at main points of entry. The system must utilize proximity reader devices rather than card swipe devices. The distribution and control of the keys and access cards shall be established and monitored by an appropriate person within the department or by the security monitoring service. Once the facility is "unlocked", electronic locking devices controlled by the Security Staff within each school will control the main facility entrances. The Security Staff will have two-way audio and one way visual contact with the individual requesting access to the school through an intercom station and CCTV cameras. In schools without Security Staff, the lock release control should be located in the Main Office or other acceptable location and retain two-way audio contact and visual contact if possible.

All school entrances will have a "walk through" metal detector supplied by the security installer upon request from the department. Hand held metal detectors shall be supplied upon request as well. Interior rooms with sensitive and expensive equipment will use keypads or card readers to provide access control with manual key alternatives.
All exterior doors shall have electronic locks that are controllable onsite as well as from a remote monitoring location in the event that a lockdown or open situation is required. The system must allow single motion egress in the event of an emergency while still allowing controlled access from the exterior. These doors must conform to fire and safety code requirements for egress of the facility.

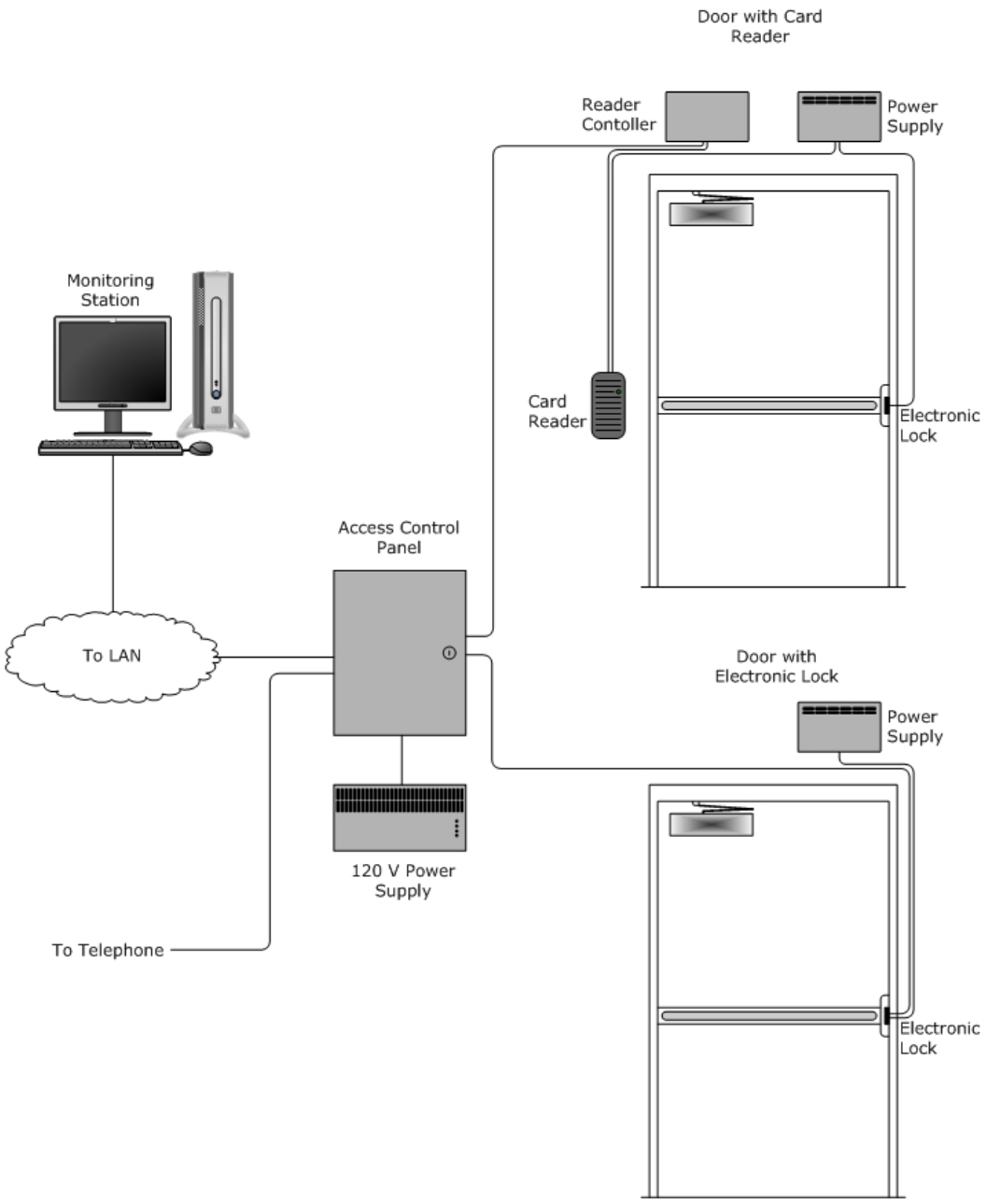
The badge system, with all the necessary equipment capable of providing cards, shall be required as part of the access control system. The badges will be issued to all

individuals requiring access to a specific facility. The badge will have detailed information and a picture to identify the carrier as well as the lock release and alarm shunt capabilities. It is recommended that the security personnel within the school system or security monitoring firm be responsible for issuing badges to the staff and students.

Additional elements required for the access control system are POTS lines for remote activation and system diagnostics. Secondary means of access control shall include perimeter and exterior gates, exterior barriers, vandal resistant windows and glass, lexan panels and protective metal screens. The inclusion of these additional access control devices shall be dependant upon the individual facility where deemed necessary by the department.

The Access Control systems in the Providence School Department shall have the following features:

- A managed ID and badging system compatible throughout the department
- Associated POTS lines
- Data transmission over the department-wide internet connections
- Electronic locks on all exterior doors
- Proximity card readers or keypads at points entry and sensitive areas
- Manuel key access in addition to card access
- Electronic locks and integrated intercom at main entry locations tied to either the Security Desk or Main Office
- System failover to backup power in emergency situations
- Remote control of the systems
- X-Ray and Metal detectors at the main points of entry
- Hand-held metal detector wands
- Access Control with programmable restriction levels per user across the entire department
- Computer based system



- ***Intrusion Detection***

Intrusion Detection systems shall be designed and implemented to alert and record unauthorized entry to a facility or a specific portion of the facility. These systems shall be capable of being partitioned into multiple zones within a facility and have keypads capable of activating or deactivating the system. Intrusion detection systems shall have onsite and remote reporting capabilities as well as onsite activation and deactivation. The system shall be programmable and capable of issuing an audible alarm and silent alarm both on and off premise. Integration of the intrusion detection system with the Fire alarm system shall be accomplished by means of a universal communicator located within the facility.

The main keypad shall be located in a secure area not readily accessible by the student population or general public. Additional keypads shall be located to activate and de-active partitions of the system, however, the master keypad shall override all other keypads.

The Providence School Department's outsourced contractor shall monitor the intrusion detection systems for the Department 24 hours every day. However, each facility will have monitoring capabilities located on site. The monitoring system shall have both visual and audio notification at the main console to alert the security personnel on duty that an event is occurring that requires immediate attention. At a minimum the type, location and time of the intrusion will be identified and stored electronically for a minimum one-month period. Activation and deactivation information by authorized personnel will be identified and stored for the same period. Report generation capabilities will be required to track information on access and events.

The exterior of the facility shall be monitored by door contacts at all points of entrance or egress into the facility. The door contacts will be recessed where possible and surface mounted switches with armored cable where recessed contacts are not feasible. Locations with highly sensitive equipment shall be supplied with glass break detectors if the department desires an additional layer of security.

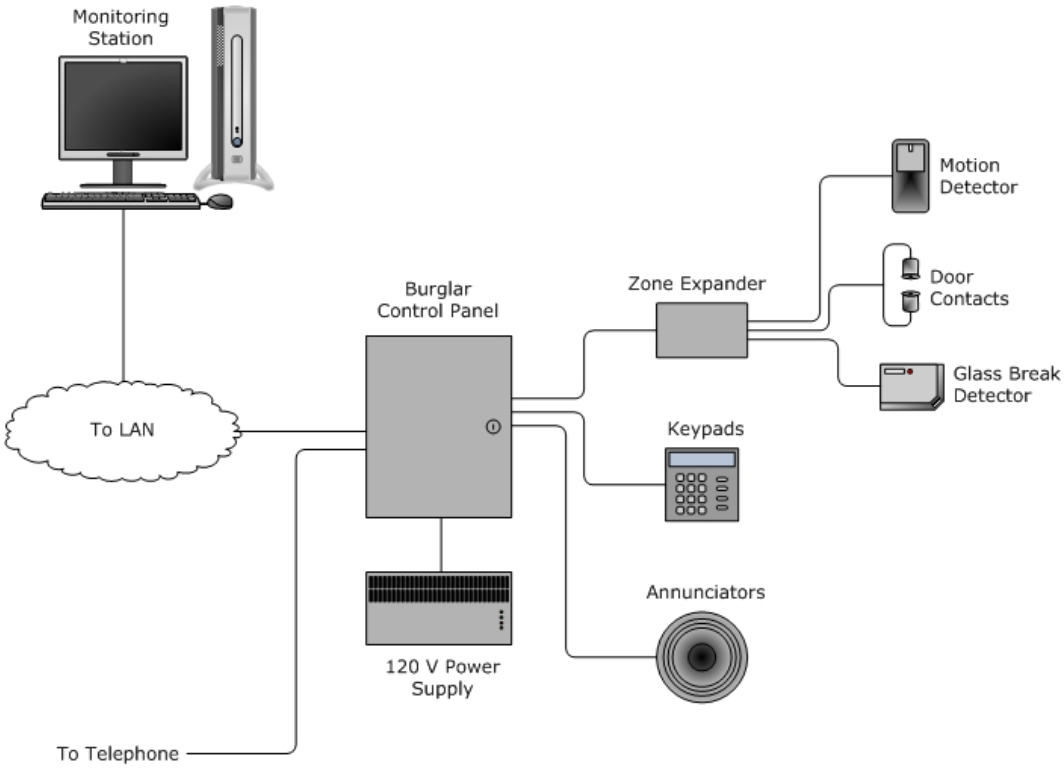
Interior protection of the school shall include motion detectors, door contacts and glass break sensors. Dual technology motion detectors shall be used to detect the movement of individuals in an alarmed area and transmit the alarm back to the monitoring station. Glass Break sensors that utilize sound and vibration detection shall be installed in areas where highly sensitive equipment or large amounts of equipment are located. Door contacts shall also be installed at main interior points of entry and egress and in areas where sensitive or expensive equipment is located. Office exit doors, laboratory rooms, pool and auditorium doors shall all have door contacts.

The intrusion detection system must be capable of having a minimum of 8 zones. All new facilities will have the perimeter door contacts wired in ¾" in-wall conduit. The system's control units will be placed in a locked cabinet with the electronic components on a separate electrical panel equipped with surge protection or rack mounted surge protection with battery backup.

The Intrusion Detection systems in new and renovated facilities shall have the following capabilities:

- ❑ Record-keeping of all activities
- ❑ Audible and visual notification of alarm conditions
- ❑ Centrally located remote monitoring and diagnostics
- ❑ Event differentiation by device type (door contacts, motion detectors)
- ❑ Zoning of the facility by usage type
- ❑ Room for future expansion for both devices and electrical capacity
- ❑ Magnetic door contacts
- ❑ Dual Technology Motion detectors suitable for every area type
- ❑ Glass Break sensors that are tripped through sound and vibration
- ❑ Alarm notification connected directly to the Providence central security station

- ❑ Light and alarm activation when system is activated
- ❑ Data transmission over the department-wide WAN



- *Video Surveillance*

Video Surveillance will provide visual monitoring of the facility, internally and externally, 24 hours per day. The system will be used to record and provide evidence of incidents and provide a deterrence of further incidents. Each school will require a separate design to determine the facility requirements and camera locations. The system designer, security staff, security monitoring firm and principal must be consulted during the requirements survey. The systems will be monitored by the school department's monitoring firm from a remote location.

The Surveillance System will be capable of transmitting over Providence School's Local and Wide Area Networks using TCP/IP protocols. Cameras will survey the corridors, specific rooms and portions of the perimeter of the facility. Digital video recordings will be transmitted from each camera location and stored for no less than 30 days on a Digital Video Recorder (DVR). All cameras shall be connected to a multiplexer/DVR unit mounted in a rack or lockable cabinet in the TR or TER or other location approved by the school department. It is recommended that each camera be connected with coaxial cable to the multiplexer/DVR in the TR and then utilize the LAN to transmit video over the fiber backbone to the main DVR/View Station at each facility. It is also possible to home-run each camera directly to a main multiplexer/DVR and tie into the department's WAN if the data backbone will not support video streaming. The storage size of the digital video recorders shall be based upon the number of cameras and selection of recording sequence. The recorder shall capture digital video from each camera at a rate of no less than one frame per second and record data and time for each image.

Additional viewing locations shall be accessible through any PC with a network connection and the proper software loaded to view and control the system. All cabling associated with the CCTV system shall be concealed in conduit in exposed areas or in areas where access is easily available to the general public.

The location of the main CCTV view station, containing the pc, monitor(s) and camera controls, shall be located based upon type of facility and personnel available to monitor the station. Typically, this location will be either the main security desk or main office. Each monitor will be capable of displaying up to 16 video images from selected cameras on each screen. The console unit will be capable of reviewing images based upon time and location inquiries.

Camera housings, bodies, and lenses shall be selected based on location and use. All cameras shall be 1/3", CCD type cameras with auto iris lenses that automatically switch from color images to black and white images in low light. The cameras will be capable of recording in both daylight and low light conditions.

Camera locations shall be as follows:

- Exterior cameras will be located at the primary entrance to each school and entrances used by the community after school hours. Exterior cameras will be positioned to cover the playgrounds, parking lots, school grounds and roof access locations. The lens enclosure shall be vandal and weather resistant with associated blowers and wipers necessary for proper viewing.

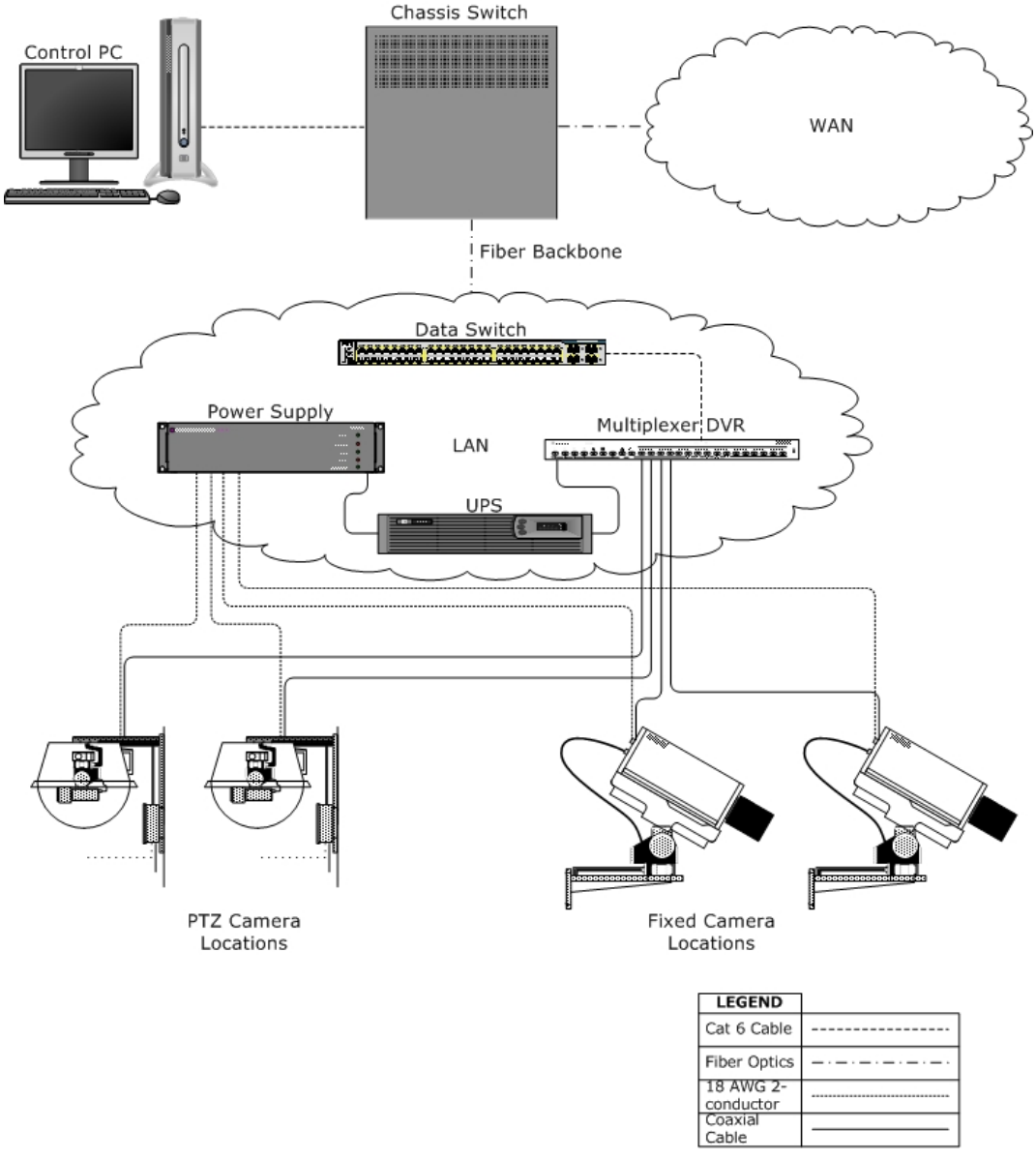
- The interior cameras and lens shall be mounted in dome type housings, be tamper resistant and positioned to provide coverage of alcoves, corridors, waiting areas, entries and exits. Additional interior cameras will be placed outside rooms with sensitive and/or costly equipment susceptible to pilferage or damage such as computer labs, science labs and other labs that have movable, high value equipment upon request from the department. These additional locations must be coordinated and approved by school department personnel during the design phase of the project.

- Self contained covert cameras shall be available for use by the security personnel in cooperation with the school administrative staff to covertly monitor specific locations.

The CCTV systems in the Providence School Department shall have the following features:

- 1/3" CCD type cameras
- Industry standard image formats
- A combination of PTZ and Fixed cameras
- Fixed cameras with vari-focal lenses
- Motion and event search of recorded video
- Alarm activation and notification
- Alarm activated camera activity
- Multiplexer/DVR units with LAN connections
- Selectable image quality by camera

- Time and date stamp
- Simultaneous record and playback for all cameras
- Various recording settings per individual camera
- Remote communication over various transmission media
- Control and viewing by security staff as well as local law enforcement agents both locally and remotely
- Main viewing and control station with integrated, recordable media (CD, DVD)



- ***Call Stations and Panic Buttons***

Wired call stations with panic buttons that report to a central location at the facility and to an offsite location can be placed in locations where individual may need assistance in the case of an emergency. These systems should provide open, two-way communications to a main panel that is handicap accessible and located near the main entrance of the facility or main office area and alert local law enforcement agents. On the interior of a facility they may be located in stairwells and in areas where a high concentration of people can occur.

4.11 Energy Management Systems

Due to the differing age of facilities and variety of necessary energy systems at those facilities, the Providence School Department has a large range of energy related equipment and contracts to maintain that equipment with service providers. As a result, the Providence School Department desires to construct and renovate facilities with a more unified platform to manage those systems. This requires that a standard for systems be implemented to monitor and control systems. Standardization will allow for:

- Fewer parts to stock and maintain in the event a system requires maintenance or part replacement
- Fewer Operations and Maintenance contracts with outside vendors since a single source can be used at multiple facilities
- Remote monitoring and control of systems since a standardized communications platform can be implemented
- Use of the existing School Department WAN and telephone lines to manage and monitor the systems
- Scalability and expansion become much easier and more efficient

The end result of a standardized approach to energy management for the school department will be:

- Lower cost to maintain and operate energy systems at facilities
- Tighter control of system performance and operation
- Fewer man hours involved in management of contracts and maintenance.

At a minimum, the systems should be compatible of communicating using TCP/IP protocols either inherently or with the addition of modules that allow signal transmission using those protocols. The use of equipment meeting this standard will allow for signal transmission on the existing school department data network and allow for management of the systems from multiple locations both on and offsite. The school department should move towards an industry standard platform such as BACnet, LON or OPC to allow their devices to communicate with one another and provide devices from as few different manufacturers as possible.

4.12 FF&E

- ***Computing Devices***

A robust infrastructure will allow computing devices to make greater use of new technologies and applications. While there is no single computer to meet all the anticipated educational needs, that equipment should follow some general guidelines. It should be:

- From a single manufacturer where at all possible
- Purchased with manufacturer support and warranty
- Conform to industry standards
- Communicate with other devices using IP protocols

Desktop computers provide a cost effective way to introduce computers into the classroom. Since books and paper are a very real part of the learning process, it is beneficial to utilize equipment with as small a footprint as possible. Flat panel monitors have significantly dropped in price and should be used as a replacement to CRT style monitors. Tower PCs or PCs with an integrated monitor and computer are another good alternative to freeing table space. Desktop computers should be provided in the following locations:

- Classroom technology cluster
- Dedicated computer labs
- Areas with advanced computing needs

Laptop computer provide portability with a penalty in cost. However, in certain educational settings, a laptop or tablet will allow for activities that would not be possible with a traditional desktop arrangement. Laptop computers should include wireless access built in to allow for connection to the LAN and have sufficient battery life to be used without having to connect to an electrical receptacle. Laptop and/or tablet PCs should be provided for the following:

- Instructor's and/or at instructor's stations
- Locations where a hardwired infrastructure would be prohibitive
- User's who require portability

Mobile Labs should also be considered as a means of providing computing devices to staff and students. Each mobile lab should be:

- Self-contained within a lockable cabinet
- Portable
- Include a wireless access point
- Provide enough storage for all associated devices
- Allow for charging of the laptop computers

The educational staff, technology staff, design team and administrators should consider both the architecture of the facility and the educational program to determine if a mobile lab will meet the needs of the school department.

For all computers, a realistic and attainable schedule to upgrade and replace devices should be implemented by the technology department. The schedule should forecast,

as much as possible, the lifecycle of the equipment taking into consideration the applications that will be used on those machines taken from the educational program. An effective way to "stretch" the anticipated lifecycle of a particular machine is to pass it from a high school environment to a middle school and/or elementary school environment since the applications used in an elementary environment are not typically as demanding.

- *Server Equipment*

Servers that relate to internal connections do qualify as E-Rate Eligible Servers and should be considered by the PSD. The following server types meet this criteria:

- ❑ E-mail
- ❑ Web Servers
- ❑ DNS Servers
- ❑ DHCP Servers

It is in the best interest of the school system to standardize this server equipment as much as possible to minimize the complexity of maintaining multiple server platforms and to simplify the approval process with the SLD for reimbursement of these eligible items.

Servers that do not fall into the above categories are not eligible for reimbursement under the E-Rate program. However, they are necessary component of the department-wide network that will allow for a shift to conform with the 21st century Teaching and Learning Model set forth in this document. The following server types include:

- ❑ File Servers
- ❑ Administrative Servers
- ❑ Any server dedicated to storage

It should be noted that servers will generally be similar to each other with the main differences coming from storage capacities and processing speed which will be determined by their specific application. Where possible, the school department should select servers with the following criteria in mind:

- ❑ Well known industry manufacturer with efficient product support
- ❑ Industry standard platforms and operating systems
- ❑ Blade style servers where possible for cost and maintenance benefits

A final critical element to successfully implementing a consistent server program will be to forecast upgrade and replacement schedules. As the digital age increasingly moves information to electronic formats it will be necessary for the servers equipment to keep pace. The school department should analyze the current situation and make realistic estimates as to when and how much money should be budgeted for ongoing maintenance and upgrades. Implementing such a schedule will increase the awareness of the necessity of these items that are often overlooked provide a realistic path forward given the inherent budget constraints associated with public education.

- *Peripheral Equipment*

Peripheral equipment, such as printers, faxes and projectors may or may not be provided by the same funding stream available from a construction and/or renovation project. Regardless, it is imperative to provide the end user with the equipment necessary to effectively communicate ideas and concepts that are part of the teaching and learning process. While a wide range of devices and equipment exist, a number of items make up the "core" equipment that should be included within an educational facility.

Classroom spaces should include at a minimum:

- ❑ Printing equipment
- ❑ Video display device, preferably a projector

Specialized learning spaces should include equipment that will effectively meet the needs associated with that environment such as:

- ❑ All-in-One printing equipment
- ❑ Plotting equipment
- ❑ Scientific probes
- ❑ IP capable video equipment
- ❑ Video display equipment, preferably a projector
- ❑ Document Cameras

Administrative areas should provide equipment with an emphasis of document production such as:

- ❑ Printers
- ❑ All-In-One Printer/Scanner/Faxes
- ❑ Video display device, preferably a monitor/TV

It is important to tailor each space with the proper equipment matched to the educational goals set forth in the technology learning standards. The educational staff, technology staff, design team and administrators should all be aware of and involved in the selection of peripheral equipment from an early stage.

While the planning and budgeting for this equipment should be considered in the early stages of a project, the purchase of this equipment should be reserved until the infrastructure is ready to accept these devices. This will allow the department to maximize the dollars put towards this equipment by purchasing the "latest and greatest" rather than having out of date equipment be installed in a state of the are facility. The cost of technology equipment falls as newer devices supersede the older for usually around the same cost.

Chapter 5 Technology Implementation Planning

Central Premise of Technology Plan

Significant and continuing improvement in student achievement requires:

- **A major paradigm shift creating a new classroom Teaching and Learning Model where;**
  - The teachers' role changes from predominately lecture to that of a facilitator, mentor, and manger of instruction;
  - Students become active participates in a collaboration, project based, small group learning environment;
  - Students acquire critical thinking, problem solving, information analysis, and life long learning skills;
  - Parents and community are engaged; and where
- **The new Teaching and Learning Model is effectively supported by an infusion of ubiquitous classroom technology.**

This Chapter contributes to the Central Premise by:

- presenting budget requirements
- providing implementation action plan
- defining plan monitoring and evaluation requirements

Chapter 5 Technology Implementation Planning

5.1 Estimated Budgets

Blank

5.2 Action Plan

Strategies	Year 1	Year 2	Year 3	Beyond Year 3	Responsibility Level*
Goal 1: Continue to upgrade existing Communications Infrastructure and networks in all schools to support the technology plan.					
1.1 Identify, design and install telecommunication rooms and telecommunication equipment rooms that meet BICSI standards in all schools.	✓	✓			IT
1.2 Continue to expand the Wide Area Network bandwidth capability to schools to support expanded classroom access to technology.	✓				IT
1.3 Continue to increase, maintain and upgrade network servers to support expanded school-based LAN's.	✓	✓			IT
1.4 Design and install upgraded electrical power plant in all existing schools to support the increased focus of technology utilization in classrooms.			✓	✓	Facilities
1.5 Develop a process to effectively manage the district's expanding Wide Area Network (WAN) and multiplying Local Area Networks (LAN).	✓				IT
1.6 Objective Continue to research, develop and implement District-wide strategies regarding Internet filtering and acceptable use policies.	✓				IT

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Strategies	Year 1	Year 2	Year 3	Beyond Year 3	Responsibility Level*
Goal 2: Upgrade the Communications Infrastructure in non-demonstration schools to support refocusing of technology access from computer labs to classrooms and the creation of one technology supported new T&L model demonstration classroom which comes as close as practical to replicating the classrooms in the demonstration schools.					
3.1 Design and install a LAN which supports a minimum of 1 teacher and 5 student data CNO's in the demonstration classroom that are positioned to support the defined teaching and Learning model.	✓	✓	✓	✓	IT
2.2 Design and install a wireless data infrastructure to support 6-8 students in every classroom.	✓	✓	✓	✓	IT
2.3 Design and install a ceiling mounted LCD projection video presentation system in the demonstration classroom.	✓	✓	✓	✓	IT

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Strategies	Year 1	Year 2	Year 3	Beyond Year 3	Responsibility Level*
Goal 3: Upgrade Communications Infrastructure in the three schools to be demonstration schools to meet the criteria for voice, video, data, and security systems and Communications Network Outlets (CNO's) necessary to support teaching and learning model described in the central premise.					
3.1 Solicit proposals and select three schools to become demonstration centers that model the complete new teaching and learning environment defined by the central premise.	✓				PSD, TF
3.2 Conduct a detailed technology assessment and equipment inventory of the selected demonstration schools and develop detailed specifications of infrastructure and technology equipment needs.	✓				IT
3.3 Develop a model science lab for each type of school (elementary, middle, & high) in which technology is integrated into both class and lab teaching and learning.		✓			O, IT
3.4 Research, design/acquire and implement a portable tablet PC based smart cart with LCD projector that simulates the functionality of a ceiling mounted LCD.	✓				IT
3.5 Develop a model media center for each type of school (elementary, middle, & high) in which the center becomes the center of technology distribution to other learning areas and a repository of specialized net-workable equipment such as that required to support student electronic profiles.		✓			O, IT
3.6 Design and install a LAN which supports a minimum of 1 teacher and 2 student data CNO's in each classroom that are positioned to support the defined teaching and Learning paradigm.			✓		IT
3.7 Design and install a wireless data infrastructure to support 6-8 students in every classroom.			✓		IT

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Strategies	Year 1	Year 2	Year 3	Beyond Year 3	Responsibility Level*
3.8 Design and install a two-way interactive video distribution system throughout every school to support learning space utilization of video.			✓		IT
3.9 Design and install a ceiling mounted LCD projection video presentation system in every classroom.			✓		IT
3.10 Design and install telephone cable plant system that would allow voice communications in every classroom		✓	✓		IT
3.11 Design and install upgraded electrical power plant			✓		Facilities

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Strategies	Year 1	Year 2	Year 3	Beyond Year 3	Responsibility Level*
Goal 4: Review, edit and adapt standards to ensure that all modernized and new schools meet the Communications Infrastructure criteria for voice, video, data, and security systems and Communications Network Outlets (CNO's) described in Chapter 4.					

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Strategies	Year 1	Year 2	Year 3	Beyond Year 3	Responsibility Level*
Goal 5: Equip all classrooms, media centers, science labs, and other learning spaces in the demonstration schools and demonstration classrooms of other schools with the appropriate technology equipment to support the new teaching and learning model described in the central premise.					
5.1 Research, acquire and implement low-cost alternatives to desktop computing devices and resources that have proven successful in supporting classroom curricular goals, such as tablet PC's, in sufficient quantities to provide a 2:1 classroom ratio.	✓	✓	✓	✓	IT
5.2 Develop and support a consistent standard for the amount and type of technology in the typical classroom at each grade level and/or discipline.	✓				TF
5.3 Relocate existing lab computers into classrooms as enhancements to the network will allow.	✓	✓	✓	✓	IT
5.4 Develop and implement strategies for providing student, family, and teacher access to technology during after school hours.	✓				TF
5.5 Develop and implement tablet PC based portable LCD projector cart that could be implemented in non demonstration schools.	✓	✓	✓	✓	IT
5.6 Procure and upgrade computing equipment for classrooms, media centers and other learning environments in accordance with established standards, allocation programs, and critical mass guidelines.	✓	✓	✓	✓	IT
5.7 Set clear policy regarding compliance with technology standards and establish a system for monitoring enforcement.	✓				TF

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Strategies	Year 1	Year 2	Year 3	Beyond Year 3	Responsibility Level*
5.8 Continue to research, develop and implement District-wide strategies regarding Internet filtering and acceptable use policies.	✓				IT
5.9 Develop clear policies, standards of service, and procedural guidelines regarding installation of new instructional technology equipment, upgrading and maintenance of older equipment, and phasing out of obsolete equipment.	✓				TF

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Strategies	Year 1	Year 2	Year 3	Beyond Year 3	Responsibility Level*
Goal 6: Create an environment and provide the resources that will allow all teachers to attain the skills necessary to become effective managers and facilitators of instruction.					
6.1 Identify and quantify the teacher instructional competencies, communications skills, and performance levels necessary to support the technology supported teaching and learning model characterized in the central premise.	✓				PSD, TF
6.2 Identify and categorize teacher and library-media specialists' technology competencies levels necessary to support the technology supported teaching and learning model characterized in the central premise.	✓				O
6.3 Review and evaluate the current required professional development offerings and modify as necessary to provide teachers opportunities to obtain the competencies to be effective in the teaching and learning model characterized in the central premise.	✓				O
6.4 Encourage more teachers and principals to participate in the Department of Education/University of Rhode Island RITTI program to build their technology competencies.		✓			PSD
6.5 Include function-related technology competencies into human resource activities, such as, recruitment, hiring, staff development, supervision, and evaluation.		✓			O
6.6 Establish a comprehensive staff development planning model to address the needs of all staff that includes parameters for district- and school-level technology training.			✓		PSD, TF
6.7 Encourage more teachers to participate in the Department of Education/University of Rhode Island RITTI program to build their technology competencies.	✓				O

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Strategies	Year 1	Year 2	Year 3	Beyond Year 3	Responsibility Level*
6.8 Develop and implement a competency-based Individual Staff Development Plan (ISDP) system.			✓		O

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Strategies	Year 1	Year 2	Year 3	Beyond Year 3	Responsibility Level*
Goal 7: Create an environment and provide resources that will allow all students to equitably obtain access to the technological and social skills required to thrive in the new T&L model and function successfully in the twenty-first century.					
7.1 Review, modify, and adapt the draft set of K-12 student technology standards in Appendix A	✓				TF
7.2 Identify and quantify the student problem solving, social, and student personal communications skills necessary to thrive in the new the technology supported teaching and learning model.		✓			TF
7.3 Implement a student e-mail capability to encourage the collaboration and exchange of information within learning environment and outside the district.	✓				IT
7.4 All students will recognize and practice responsible social and ethical behaviors when using technology and information, and understand the consequences of inappropriate use.	✓				TF, O
7.5 Identify and promote a variety of technology supported solutions and strategies for students at-risk which provide interventions during and beyond the standard school day.		✓			O
7.6 Develop and implement strategies for providing student, family, and teacher access to technology during after school hours.			✓		PSD

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Strategies	Year 1	Year 2	Year 3	Beyond Year 3	Responsibility Level*
Goal 8: Implement a technology based classroom assessment and instructional management system that will allow teachers to become efficient managers of every students' learning plan.					
8.1 Implement a comprehensive assessment system that is easy-to-use, composed of multiple indicators, and provides teachers and administrators with information about student mastery of learning standards to enable more targeted instruction.				✓	O, IT
8.2 Identify and implement strategies for providing teachers with current student information to help informed decision-making.	✓				SB, O, IT
8.3 Develop strategies to integrate technology into the K-12 curriculum areas that include descriptions of appropriate technology enriched learning environments for various grade levels and subject areas.		✓			O
8.4 Continue to upgrade the on-line teacher access assessment capabilities of the REG 2000 system.	✓	✓	✓		SB, O, IT
8.5 Upgrade or procure a new Special Education System that is SIF compliant and interfaces real-time with other administrative systems including REG 2000.		✓			O, IT
8.6 Identify and implement strategies for providing teachers with current student information to help inform decision-making.	✓				SB, O, IT

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Strategies	Year 1	Year 2	Year 3	Beyond Year 3	Responsibility Level*
Goal 9: Develop and/or obtain a web based integrated curriculum and learning system that links curricular, assessment and instructional resources.					
9.1 Examine all instructional areas in light of the need for viewing computer and video information, and develop a solution for typical instructional scenarios.		✓			O, IT
9.2 Develop strategies to integrate technology into the K-12 curriculum areas that include descriptions of appropriate technology enriched learning environments for various grade levels and subject areas.	✓				O, TF
9.3 At the District level, continue to expand the standardized core set of applications beyond the productivity suite that the District is able to support with professional development offerings and on-going integration/ implementation assistance.	✓	✓	✓		O
9.4 Identify and adopt strategies, processes and structures for systematically integrating technology into the curriculum.	✓				O
9.5 Identify and expand successful curriculum/technology integration practices currently in Providence Schools, Rhode Island and nationally.	✓	✓	✓		O, PSD
9.6 Employ technology enhanced strategies where appropriate to support instruction for the bilingual population and their families.	✓				O, IT
9.7 Assign the function, roles, and responsibilities for District website development and the establishment of standards for program, school, and classroom websites.	✓				O, IT
9.8 Work with City of Providence personnel to implement the new Lawson system to its fullest extent.		✓			O, IT

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Strategies	Year 1	Year 2	Year 3	Beyond Year 3	Responsibility Level*
9.9 Identify and promote a variety of technology supported solutions and strategies for students at-risk which provide interventions during and beyond the standard school day.	✓				O, IT

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Strategies	Year 1	Year 2	Year 3	Beyond Year 3	Responsibility Level*
Goal 10: Engage parents and community in the planning, design and operation of the learning environment defined by the central premise.					
10.1 Develop and implement strategies for providing student, family, and teacher access to technology during after school hours.	✓				O, IT
10.2 Identify and promote a variety of technology supported solutions and strategies for students at-risk which provide interventions during and beyond the standard school day.	✓				O, IT
10.3 Increase parental involvement and communication using multiple strategies such as telephone, voice messaging, Internet, web posting, and e-mail.	✓				O, IT
10.4 Seek ways to increase the number of technology-based community learning programs.		✓			O, IT
10.5 Encourage parents and community members to participate in focus group meetings for planning of the three technology demonstration schools		✓			O, IT

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Strategies	Year 1	Year 2	Year 3	Beyond Year 3	Responsibility Level*
Goal 11: Provide resources necessary for a plan to provide the technology staffing support necessary to implement the technology based teaching and learning model put forth in the central premise.					
11.1 Establish district-wide guidelines and standards of service for both school-based and district-level technology support services.	✓				IT
11.2 Develop position descriptions and technical competency requirements for the school based technology coaches.	✓				IT
11.3 Provide the necessary staff development to ensure that all existing school based technology have the ability to meet the requirements of the position description.	✓	✓			IT
11.4 Objective Establish regular meetings for school-based technology staff to meet, share learning, and address common issues.	✓	✓	✓		IT
11.5 Implement a student leadership program to supplement school-based technology support.		✓			IT

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Strategies	Year 1	Year 2	Year 3	Beyond Year 3	Responsibility Level*
Goal 12: Develop technology fluent school and central office administrators.					
12.1 All school based and central office administrators should be prepared to meet the National Educational Technology Standards (NETS) for school administrators.	✓	✓			SB, O
12.2 Develop a specific Leadership Development Program for existing principals which focuses primarily on technology skills required by the National Educational Technology Standards (NETS) for school administrators.	✓				SB, O
12.3 Expand the curriculum in the existing Leadership Development Program for potential principals to include technology skills training National Educational Technology Standards (NETS) for school administrators.		✓	✓		SB, O
12.4 Encourage more principals to participate in the Department of Education/University of Rhode Island RITTI program to build their technology competencies.	✓				SB, O
12.5 Develop the environment and provide the resources necessary to ensure that all staff effectively communicates via e-mail.	✓				SB, IT
12.6 Provide all staff with voice mail services.	✓				IT

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Strategies	Year 1	Year 2	Year 3	Beyond Year 3	Responsibility Level*
Goal 13: Utilize technology to transform business applications					
13.1 Procure a data warehouse that integrates and enhances existing databases and operational systems.		✓			O, IT
13.2 Develop as part of a district-wide human resource system, the capacity to store, manage and query personnel and competency-based human resource data.		✓			O, IT
13.3 Develop and implement standards, policies, and procedures to replace manual form reports and data duplication with electronically managed data over the District-wide network.	✓	✓	✓		O, IT
13.4 Integrate and enhance existing databases through the implementation of a new unified, School Interoperability Framework (SIF)-compliant data warehouse that brings information from many operational systems and makes it available to users through easy to use Web-based data reporting and analysis software tools.		✓			O, IT
13.5 Select and deploy appropriate end user tools that can access the REG 2000, federal, state, and district-level databases and information to support the reporting and decision making needs of the schools.	✓				O, IT
13.6 Develop specifications for an inventory/fixed asset management system that integrates with existing administrative systems for finance, procurement, and inventory.	✓				O, IT

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Strategies	Year 1	Year 2	Year 3	Beyond Year 3	Responsibility Level*
13.7 Develop inventory and tracking systems to enable monitoring of the deployment, use, and impact of technology resources.	✓				O, IT
13.8 Provide upgrades to the REG 2000 system.	✓	✓	✓		SB, O, IT
13.9 Upgrade or procure a new Special Education System that is SIF compliant and interfaces real-time with other administrative systems including REG 2000.		✓			O, IT
13.10 Develop as part of a district-wide human resource system, the capacity to store, manage and query personnel and competency-based human resource data.		✓			O, IT

***Responsibility: **SB**=School-based; **IT**=Information Technology Division; **IN**=Instructional Technology Staff; **O**=Specific Office; **PSD**=Central Office; **TF**=Task Force

Technology Standards and Policies	Year 1	Year 2	Year 3	Beyond Year 3	Responsibility Level*
Goal 14: Create an environment and provide resources that will allow for the planning and organizational development enhancements necessary to support the central premise					
14.1 Establish a Technology Standards and Policies Committee and adopt a process for periodically reviewing and setting standards for all major technology components including workstations, peripherals, networks, and system software.	✓				IT
14.2 Encourage policies and procedures at the school level for increasing student access to computers in libraries, labs and classrooms throughout the school day and after school hours.	✓				SB, IT
14.3 Include function-related technology competencies into human resource activities, such as, recruitment, hiring, staff development, supervision, and evaluation.		✓			O, IT
14.4 Establish a Technology Standards and Policies Committee and adopt a process for periodically reviewing and setting standards for all major technology components including workstations, peripherals, networks, and system software.	✓				TF, O, IT
14.5 Continue to channel federal, state, and local grants and entitlements into technology resources and initiatives that address the District's instructional priorities.	✓	✓	✓		O, IT
14.6 Review and assess the established criteria and processes for developing and reviewing Providence One Plans (POP).	✓	✓	✓		SB, O, IT

***Responsibility: **SB**=School-based; **IT**=Information Technology Division; **IN**=Instructional Technology Staff; **O**=Specific Office; **PSD**=Central Office; **TF**=Task Force

Technology Standards and Policies	Year 1	Year 2	Year 3	Beyond Year 3	Responsibility Level*
14.7 Implement POP enhancements such as, providing written feedback, building in flexibility for multi-year improvement initiatives, including professional development and technology resources into the model, and providing training and technical assistance to the school planning teams.		✓			SB, O, IT
14.8 Continue to implement the Registration Center Plan and evaluate its success on an annual basis.		✓			O, IT
14.9 Develop a comprehensive public information and internal communications plan for technology-related information.			✓		O, IT
14.10 Set clear policy regarding compliance with technology standards and establish a system for monitoring enforcement.	✓				IT
14.11 Develop clear policies, standards of service, and procedural guidelines regarding installation of new instructional technology equipment, upgrading and maintenance of older equipment, and phasing out of obsolete equipment.	✓				IT

***Responsibility: **SB**=School-based; **IT**=Information Technology Division; **IN**=Instructional Technology Staff; **O**=Specific Office; **PSD**=Central Office; **TF**=Task Force

5.3 Evaluation Plan

A major benefit of planning is that it serves as a learning catalyst. As strategic plans such as the Technology Plan are put into place, the Providence School Department (PSD) must strive to monitor, evaluate, and revise its plans for maximum effectiveness. Strategies to be included in this reflective process consist of ongoing data collection regarding selected performance measures, timely communication of data and analyses to key decision makers, and periodic reports that address both implementation and impact assessment. This section of the plans deals with:

- Plan Monitoring Approaches
- Plan Evaluation Approaches
- Monitoring/Evaluating the Technology Plan

If planning is a catalyst for learning, then the Technology Plan must incorporate processes, structures, and tools for monitoring the implementation of the plan and evaluating its impact in terms of quality and effectiveness. To accomplish this work PSD needs to create a system addressed to both monitoring of key tasks, activities, and milestones as well as to judging the quality, effectiveness, and efficiency of the educational technology system. The system would require ongoing data collection regarding selected performance measures, timely communication of data and analyses to key decision makers, and periodic reports that address both implementation progress and impact assessment. The system should include an assignment of responsibilities, timely monitoring of all major implementation tasks and activities, ongoing communication, and adherence to a plan-do-plan-do cycle.

The system for monitoring and evaluation should include four essential components:

- **Strategic results**. Processes and structures for clarifying and selecting key results, usually stated as performance outcomes.
- **Indicators and measures**. Processes and structures for identifying variables and performance measures for strategic results.
- **Data collection and analysis**. Processes and structures for collecting and aggregating data and preparing and presenting useful analyses.
- **Dissemination and utilization.** Processes and structures for timely communication of analyses and facilitating their use by key decision makers at school, local department, and Department levels.

- *Plan Monitoring Approaches*

Typically, implementation monitoring is focused on the execution of plan initiatives. The purpose of implementation monitoring is to provide real-time information. Implementation monitoring requires systems for watching and adjusting in a real-time mode to maintain compliance with the plan and to guide decisions regarding adjustments. PSD decision-makers need to track important data and communicate that data effectively to a variety of stakeholders.

Implementation monitoring strategies address questions such as:

- Were tasks completed as designed? Were implementation timelines met? If not, why?
- What barriers were encountered during implementation? How were they addressed?
- What adjustments were made in key tasks and activities? Why? To what effect?
- What are the implications of these mid-course corrections for improving or redesigning the plan?

Key system components related to monitoring plan implementation are:

- Identification of Tasks, Deliverables, and Timelines. Each major initiative or program should include a delineation of tasks and timelines.
- Discrepancy Analysis. Each project evaluator should undertake a discrepancy analysis of expected versus actual implementation schedules.
- Information Systems. The use of project management software would allow PSD to employ continuous feedback systems to monitor time lines, key events, and measures of cost and productivity. Such software, and related databases, can document, capture, and make information widely accessible on the myriad of small, immediate adjustments occurring during implementation.
- Communication. Processes, structures, and tools need to be established for uniform communication regarding adherence to timelines and related deliverable specifications.
- Decision-making Structures. Processes and structures need to be established for informing decisions about mid-course corrections and possible redesign of project/program initiatives. Maintain all monitoring information in a database, accessible by key decision-makers during the monitoring cycle.

- *Plan Evaluation Approaches*

While implementation monitoring is important at the state and department levels, particular emphasis needs to be given to evaluating the impact of the Technology Plan, particularly as the plan increases its emphasis on technology integration into teaching and learning and administration and management. The purpose of the evaluation component of a comprehensive system is to provide ongoing information on impact.

Evaluation strategies address questions such as:

- How is technology contributing to Departments' core capacities for strategic educational improvement?
- How is technology contributing to improved student learning?
- How is technology contributing to improve organizational learning?

PSD should take these action steps to develop the evaluation components of the system:

- **Identify specific strategies based on selected instructional technology goals.** Using PSD' updated instructional technology goals, strategies for selected goals to be evaluated need to be chosen. Not all strategies can be assessed due to their number.
- **Identify, benchmarks, and measures for each strategy**. Related to each strategy will be benchmarks and measures. A benchmark is a specific target that provides a sense of what the strategy is trying to attain. Measures must also be determined. A measure is an item reflecting the evidence needed to answer a research question, inform an indicator, or to determine how close the organization is in achieving a benchmark. A measure typically includes data such as percentage, test scores, ratios, etc.
- **Assign responsibility for evaluating each strategy to the appropriate PSD staff or unit.** Evaluation should be embedded within the appropriate PSD program unit responsible for each strategy. The assessment process should be simultaneously top-down and bottom-up, gathering information from the operating system about what is happening in schools with respect to the strategies, what new or enhanced interventions are needed to obtain the results, and what new or unanticipated outcomes and results are being realized.
- **Select measures and methods.** Data gathering will require the use of uniform measures and methods for each strategy. If data is gathered from the field, the Department will need to follow standards for assuring quality data collection and analysis.
- **Establish a database for tracking performance measures.** Such databases can be linked to Web-based tools for data entry and analysis. The system should employ databases, preferably electronic, for collecting, organizing, and disseminating data and information in diverse forms to serve multiple audiences. For example, the system would provide guidance in developing databases of best practices in several categories--teaching and learning, communications, administration, and management. These databases address what is working and why and what is not working and why. Databases can also be used to set up discussions on various instructional and administrative strategies; even chat rooms among teachers and principals are very useful. The intent is to make information available to all using the Department's telecommunications infrastructure as well as more traditional means of communication.
- **Develop analysis and reporting procedures and formats.** Detailed analytic reports and simple Web-based displays linked to key strategies and indicators should be used.
- **Identify key decision makers requiring specific data.** Decision makers must be targeted regarding their information needs and decision-making contexts. Prepare reports for technology leaders, Department and local department leaders, schools, and the public.

Selecting appropriate variables and tracking relevant strategies pose serious challenges. While there is considerable pressure to judge the effectiveness of technology using student performance data, there is a concern with using one measure to judge effectiveness, particularly student performance as assessed by current measures. The system must use multiple indicators and measures in order to enhance the validity and reliability of such judgments.

Distilling out the unique contribution of educational technology in a complex intervention is a formidable task. Rather than attempt such a distillation at this early stage of technology integration, it might be more appropriate to document what is going on, particularly with respect to programs and practices that appear to be exemplary.

Technology innovations often change the whole learning environment, making it difficult to undertake analytical studies, particularly in schools. Education technology integration needs to be viewed as complex bundles of changes. It is unlikely that the Department will have enough regression analysis tools to accomplish the distillation required for analytic work with respect to most of these variables. The Department will implement a bundle of interventions when they introduce technology into teaching and learning. Thus, it needs to examine the interface between technology and the curriculum materials, content, pedagogy, professional development, assessment, and the learning environment.
In many instances it is premature to conduct analytic studies that attempt to isolate the unique contribution of the technology on student performance, particularly when measured by standardized tests. There is a need for balanced attention to analytic and systemic approaches.

Rather than attempting to distill out the unique contribution of technology to a specific initiative or even to a specific learning outcome, PSD should consider using more holistic, qualitative data in the form of rich descriptions of what is happening in classrooms with respect to technology-embedded learning opportunities. In many cases technology's real impact may be in areas that are not under the analytic spotlight. It will take a systemic approach to illuminate the issues and their interconnectedness. A system that collects rich/thick description may be more appropriate and is a task that practitioners may be able to perform most effective. The challenge is to create simple systems for teachers that enable them to collect useful data on instructional practices that serve as measures of high learning performance.

The real impact of technology may be in areas receiving little department attention. Instead of asking, “Do computers work?” departments need to ask, “What specific applications, under what circumstances, appear to contribute most to increased student learning?” With such a system in place, the department can be more precise in addressing questions about the broad impact of education technology investments, as well as on more specific questions regarding specific outcomes. The Department need rich description as well as quantitative data on a diverse set of variables, most often focused where the real impact may be—on the nature of the learning process itself. Decision-makers need to track important data and to communicate that data effectively to a variety of stakeholders.

PSD should consider these process steps in their assessment design:

- ❑ Prioritize and determine appropriate plan outcomes
- ❑ Identify indicators, benchmarks, and measures for each goal
- ❑ Assign responsibility for each outcome assessment to the appropriate PSD staff or unit
- ❑ Establish a database for tracking performance measures
- ❑ Develop analysis and reporting procedures and formats
- ❑ Identify key decision makers requiring specific indicator data

- *Communication Processes*

An additional challenge is how to disseminate data to all those who need to know. A different approach is proposed that redefines the task as one of accountability rather than dissemination; that is, the Department should assign data collection on indicators

to those units or staff accountable for accomplishing the objectives related to those indicators. When specific staff members are accountable for certain outcomes, they will have a built-in self-interest in the scope and quality of the data they require. If this alignment of need and use is not established, communication becomes a problem of dissemination—convincing various people to access and analyze data they are not convinced they need.

It is important to recognize that long reports are not the only way to communicate results. PowerPoint presentations, informational meetings, and web pages are but a few alternative possibilities.

- *Monitoring the Technology Plan*

PSD should establish a Technology Plan monitoring committee to meet periodically to determine the progress being made towards accomplishment of the plan milestones. This committee can be a sub-set of the Technology Planning committee and should be chaired by the Chief Technology Officer. The committee should provide a semi-annual report and presentation to the Board of Education. The milestones established for monitoring should correspond to the three main components of the plan:

- Re-focusing of technology intro classrooms and establishment of a single demonstration classroom in each school,
- Creation of three technology rich demonstration schools in which the new Teaching and Learning Model is implemented, and
- Technology systems in new and renovated schools.

The milestones established should also relate to the schedules established in the action plan in Chapter 5

- *Evaluating the Technology Strategies*

The evaluation design for this Technology Plan will be comprised of formative and summative evaluations that will assess progress in the plans seven target areas. Specific evaluation activities to be used in each target area are listed below:

- Communications Infrastructure and Equipment
  - Interviews with selected teachers and principals
- Professional Development
  - Focus group meetings with principals and teachers
  - Survey instruments distributed to a larger group of teachers
  - Interview with teachers from demonstration classrooms
- Student Technology Initiatives
  - Survey instruments distributed to students participating in demonstration classrooms
- Curriculum and Assessment
  - Interviews with selected teachers and principals

- Community Development
  - Focus group meetings with parents and community representatives
- Technical Support
  - Interviews with selected teachers and principals
  - Survey instruments distributed to a larger group of teachers and principals
- Administrative Applications
  - Interviews with selected teachers and principals
- Technology Standards and Policies
  - Technology Planning Committee review

In addition to the above, it is anticipated that the Department of Research, Assessment & Evaluation would be responsible for establishing a longitudinal comparative pre-post evaluation to determine the effectiveness of the technology enhanced demonstration classrooms. This multi-year study would seek to determine the achievement gains and other benefits derived by students and teaching from a well established implementation of the new Teaching and Learning Model.

- *Plan Upgrade Strategies*

The Technology and Curriculum divisions should establish a planning subcommittee that meets three times a year to share and discuss results of monitoring and evaluation efforts. Any reporting documents or resources will be prepared. Based upon results to date, detailed plans for subsequent planning phases will be developed. Additional strategies will be added to the plan. The plan may be established and maintained as a web-based resource available for review on the Department-wide web site at any time by all stakeholders.

Appendix

Appendix

- ***Appendix A-National Educational Technology Standards***

National Educational Technology Standards (NETS)
For All Students
(developed by ISTE, 1999)

The Technology Foundation Standards for students are divided into six broad categories:

- Basic operations and concepts
- Social, ethical, and human issues
- Technology productivity tools
- Technology communications tools
- Technology research tools
- Technology problem-solving and decision-making tools

Standards within each category are to be introduced, reinforced, and mastered by students. These categories provide a framework for linking performance indicators found within the Profiles for Technology Literate Students to the standards. Teachers can use these standards and profiles as guidelines for planning technology-based activities in which students achieve success in learning, communication, and life skills.

A major component of the NETS Project is the development of a general set of profiles describing technology literate students at key developmental points in their pre-college education. These profiles reflect the underlying assumption that all students should have the opportunity to develop technology skills that support learning, personal productivity, decision-making, and daily life. These profiles and associated standards provide a framework for preparing students to be lifelong learners who make informed decisions about the role of technology in their lives.

The Profiles for Technology Literate Students provide performance indicators describing the technology competence students should exhibit upon completion of the following grade ranges:

- Grades PreK - 2
- Grades 3 - 5
- Grades 6 - 8
- Grades 9 - 12

These profiles are indicators of achievement at certain stages in Pre K-12 education. They assume that technology skills are developed by coordinated activities that support learning throughout a student's education. These skills are to be introduced, reinforced, and finally mastered, and thus, integrated into an individual's personal learning and social framework. They represent essential, realistic, and attainable goals for lifelong learning and a productive citizenry.

The standards and performance indicators are based on input and feedback from educational technology experts as well as parents, teachers, and curriculum experts. In addition they reflect information collected from the professional literature and local, state, and national documents.

Technology Foundation Standards for Students

1. Basic operations and concepts
   - Students demonstrate a sound understanding of the nature and operation of technology systems.
   - Students are proficient in the use of technology.

2. Social, ethical, and human issues
   - Students understand the ethical, cultural, and societal issues related to technology.
   - Students practice responsible use of technology systems, information, and software.
   - Students develop positive attitudes toward technology uses that support lifelong learning, collaboration, personal pursuits, and productivity.

3. Technology productivity tools
   - Students use technology tools to enhance learning, increase productivity, and promote creativity.
   - Students use productivity tools to collaborate in constructing technology-enhanced models, preparing publications, and producing other creative works.

4. Technology communications tools
   - Students use telecommunications to collaborate, publish, and interact with peers, experts, and other audiences.
   - Students use a variety of media and formats to communicate information and ideas effectively to multiple audiences.

5. Technology research tools
   - Students use technology to locate, evaluate, and collect information from a variety of sources.
   - Students use technology tools to process data and report results.
   - Students evaluate and select new information resources and technological innovations based on the appropriateness to specific tasks.

6. Technology problem-solving and decision-making tools
   - Students use technology resources for solving problems and making informed decisions.
   - Students employ technology in the development of strategies for solving problems in the real world.

Profiles for Technology Literate Students
GRADES PreK – 2

Performance Indicators:

All students should have opportunities to demonstrate the following performances.

Prior to completion of Grade 2 students will:

- ❑ Use input devices (e.g., mouse, keyboard, remote control) and output devices (e.g., monitor, printer) to successfully operate computers, VCRs, audiotapes, and other technologies. (1)
- ❑ Use a variety of media and technology resources for directed and independent learning activities. (1, 3)
- ❑ Communicate about technology using developmentally appropriate and accurate terminology. (1)
- ❑ Use developmentally appropriate multimedia resources (e.g., interactive books, educational software, elementary multimedia encyclopedias) to support learning. (1)
- ❑ Work cooperatively and collaboratively with peers, family members, and others when using technology in the classroom. (2)
- ❑ Demonstrate positive social and ethical behaviors when using technology. (2)
- ❑ Practice responsible use of technology systems and software. (2)
- ❑ Create developmentally appropriate multimedia products with support from teachers, family members, or student partners. (3)
- ❑ Use technology resources (e.g., puzzles, logical thinking programs, writing tools, digital cameras, drawing tools) for problem solving, communication, and illustration of thoughts, ideas, and stories. (3, 4, 5, 6)
- ❑ Gather information and communicate with others using telecommunications, with support from teachers, family members, or student partners. (4)

Profiles for Technology Literate Students
GRADES 3 – 5

Performance Indicators:

All students should have opportunities to demonstrate the following performances.

Prior to completion of Grade 5 students will:

- ❑ Use keyboards and other common input and output devices (including adaptive devices when necessary) efficiently and effectively. (1)
- ❑ Discuss common uses of technology in daily life and the advantages and disadvantages those uses provide. (1, 2)
- ❑ Discuss basic issues related to responsible use of technology and information and describe personal consequences of inappropriate use. (2)
- ❑ Use general purpose productivity tools and peripherals to support personal productivity, remediate skill deficits, and facilitate learning throughout the curriculum. (3)
- ❑ Use technology tools (e.g., multimedia authoring, presentation, Web tools, digital cameras, scanners) for individual and collaborative writing, communication, and publishing activities to create knowledge products for audiences inside and outside the classroom. (3, 4)
- ❑ Use telecommunications efficiently and effectively to access remote information, communicate with others in support of direct and independent learning, and pursue personal interests. (4)
- ❑ Use telecommunications and online resources (e.g., e-mail, online discussions, Web environments) to participate in collaborative problem-solving activities for the purpose of developing solutions or products for audiences inside and outside the classroom. (4, 5)
- ❑ Use technology resources (e.g., calculators, data collection probes, videos, educational software) for problem solving, self-directed learning, and extended learning activities. (5, 6)
- ❑ Determine when technology is useful and select the appropriate tool(s) and technology resources to address a variety of tasks and problems. (5,6)
- ❑ Evaluate the accuracy, relevance, appropriateness, comprehensiveness, and bias of electronic information sources. (6)

Profiles for Technology Literate Students
GRADES 6 –8

Performance Indicators:

All students should have opportunities to demonstrate the following performances.

Prior to completion of Grade 8 students will:

- ❑ Apply strategies for identifying and solving routine hardware and software problems that occur during everyday use. (1)
- ❑ Demonstrate knowledge of current changes in information technologies and the effect those changes have on the workplace and society. (2)
- ❑ Exhibit legal and ethical behaviors when using information and technology, and discuss consequences of misuse. (2)
- ❑ Use content-specific tools, software, and simulations (e.g., environmental probes, graphing calculators, exploratory environments, Web tools) to support learning and research. (3,5)
- ❑ Apply productivity/multimedia tools and peripherals to support personal productivity, group collaboration, and learning throughout the curriculum. (3, 6)
- ❑ Design, develop, publish, and present products (e.g., Web pages, videotapes) using technology resources that demonstrate and communicate curriculum concepts to audiences inside and outside the classroom. (4, 5, 6)
- ❑ Collaborate with peers, experts, and others using telecommunications and collaborative tools to investigate curriculum-related problems, issues, and information, and to develop solutions or products for audiences inside and outside the classroom. (4, 5)
- ❑ Select and use appropriate tools and technology resources to accomplish a variety of tasks and solve problems. (5, 6)
- ❑ Demonstrate an understanding of concepts underlying hardware, software, and connectivity, and of practical applications to learning and problem solving. (1, 6)
- ❑ Research and evaluate the accuracy, relevance, appropriateness, comprehensiveness, and bias of electronic sources concerning real-world problems. (2, 5, 6)

Profiles for Technology Literate Students
GRADES 9 –12

Performance Indicators:

All students should have opportunities to demonstrate the following performances.

Prior to completion of Grade 2 students will:

- ❑ Identify capabilities and limitations of contemporary and emerging technology resources and assess the potential of these systems and services to address personal, lifelong learning, and workplace needs. (2)
- ❑ Make informed choices among technology systems, resources, and services. (1, 2)
- ❑ Analyze advantages and disadvantages of widespread use and reliance on technology in the workplace and in society as a whole. (2)
- ❑ Demonstrate and advocate for legal and ethical behaviors among peers, family, and community regarding the use of technology and information. (2)
- ❑ Use technology tools and resources for managing and communicating personal/professional information (e.g., finances, schedules, addresses, purchases, correspondence). (3, 4)
- ❑ Evaluate technology-based options, including distance and distributed education, for lifelong learning. (5)
- ❑ Routinely and efficiently use online information resources to meet needs for collaboration, research, publication, communication, and productivity. (4, 5, 6)
- ❑ Select and apply technology tools for research, information analysis, problem solving, and decision making in content learning. (4, 5)
- ❑ Investigate and apply expert systems, intelligent agents, and simulations in real-world situations. (3, 5, 6)
- ❑ Collaborate with peers, experts, and others to contribute to a content-related knowledge base by using technology to compile, synthesize, produce, and disseminate information, models, and other creative works. (4, 5, 6)

- ***Appendix B-Sample Job Descriptions***

Chief Technology Officer
Type: Existing Full-time Position

Responsibilities

-Manages department technology staff and all projects
-Develops the long-term and short-term project plans to enhance learning and teaching through educational technologies, guiding the design and development of infrastructure and web-based delivery systems
-Prepares budgets and generates purchase orders and related expense reports.
-Performs a building-by-building analysis of the facilities to ensure adequate, data, voice, video, electrical and wide-area and Internet are available.
-Develops the specifications and scope of work efforts for all projects and researches appropriate funding through resources such as the e-rate and ESEA programs.
-Recommends the resources for implementing the contracted technology services.
-Ensures that all policies, procedures, bid processes Requests for Proposals (RFPs) and paperwork are followed and submitted.
-Ensures the provision of adequate department-wide user support and assistance for computer-related technology.
-Supervises technology employees (especially building level technology support staff)
-Develops and implements of department technology policies and procedures
-Performs skilled work in the design, installation, configuration and maintenance of computers, network systems, and other related equipment
-Requisitions and maintains an adequate supply of parts and repair materials
-Coordinates in-service training programs relative to the operation and maintenance of computers, network systems, and electronic equipment
-Serves as primary department e-mail postmaster, and systems administrator,
-Coordinates interrelations between department server resources coordinates special projects as necessary
-Writes grant proposals as appropriate
-Acts as K-12 resource person advising schools on software and hardware purchases and makes recommendations
-Evaluates hardware and software, and helps coordinate software licenses and inventories in conjunction with Director of Instructional Technology
-Provides leadership to the Department Educational Technology Committee, assisting in the design and implementation of Technology Plans and retrofitting activities
-Coordinates technology demonstrations and technology tours
-Delivers technology presentations to groups.
-Acts as department technology liaison to the community
-Develops system for technology repair and maintenance
-Coordinates responses to requests for assistance
-Troubleshoots software, hardware and Telecommunications problems.
-Estimates time and cost of materials required for work orders and other related requests.
-Ensures internal inventory of computer and networking parts and supplies
-Compiles and prepares reports and presentations as required.
-Compiles and prepares reports and presentations as required

Network Manager/City Hall Coordinator
Type: Existing Full-time Position

Responsibilities

-Provides technology support and assistance for:
-Computer systems connected to networks
-Telephone services
-Closed circuit television/security systems
-Library cataloging system
-Building-wide LAN network
-Building-wide integrated networks
-Audio/video distance learning systems
-Department level computer networks/headends
-School administrative computer systems
-Regional networks, distance learning, internet, cable TV
-Works with the IT department of the Providence City Hall to coordinate the integration of the
-Financial and HR package with the school system
-Monitors and manages all network performance
-Makes recommendations and implements network upgrades.
-Provides evaluation and acceptance testing of third-party installations, understanding of all aspects of data storage on hard disks and be able to recover both network and systems from hard disk crashes with minimal data loss.

Technology Support and Consultants
Type: New Position, contracted services or outsourced

Responsibilities

-Assists in providing technology support and assistance for:
-Stand alone computer systems
-Telephone services
-Closed circuit television/security systems
-Library cataloging system
-Building-wide LAN network
-Building-wide integrated networks
-Audio/video distance learning systems
-Department level computer networks/headends
-School administrative computer systems
-Regional networks, distance learning, internet, cable TV

REG 2000 Team
Type: Contracted Service

Responsibilities

-Assumes the responsibility for development, deployment, and project management of the REG 2000 Student Information System and new modules.
-Works with the DSS staff to deploy a solution that will provide decision support to a wide range of users with information that comes from the REG 2000 and a variety of other existing and projected operational information systems.
-Develops the queries, templates and reports for supporting a local decision support requirements
-Works with the Rhode Island Department of Education to implement a system for ensuring that the data is available and in a useable format for meeting state reporting requirements and the department's needs for decision support
-Coordinates and maintains the access by departmental staff to the Student Information System (REG 2000) online, query, and web components for a designated area or department

Decision Support System (DSS) Team
Type: Contracted Service

Responsibilities

-Deploys a total DSS solution that will provide decision support to a wide range of users with information that comes from a variety of existing and projected operational information systems.
-Develops the requirements, specifications, and project plans for implementing a data warehouse for integrating all the necessary applications into an effective decision support system.
-Assumes the responsibility for development, deployment, and project management of the DSS.
-Develops the queries, templates and reports for supporting a local decision support requirements.
-Works with the Rhode Island Department of Education to implement a system for ensuring that the data is available and in a useable format for meeting state reporting requirements and the department's needs for decision support.

Coordinator Technical Services
Type: New Position

Responsibilities

-Provides technical assistance to third party support organizations such as telephone companies, contract repair technicians and network installers, and other service providers. Provides department-wide technical support and leadership for both academic and administrative technology needs.
-Constructs special purpose computer equipment
-Supervises resources services in the diagnosis, installation, operation, and use of wide area data networks
-Provides for and assists in the planning and supervision of cabling for local and wide area network
-Supervises and assists in analyzing local area and wide are network traffic
-Provides network cabling and the diagnosis of site-based local and wide -area network hardware and peripheral equipment

Technical Services Expediter
Type: New Position

Responsibilities

-Designs, modifies, installs and supports department-wide computer networks
-Manages and builds both computer systems and networks from the ground up including hard disk set up, network interface card configuration and oversight of network routers, hubs and patch panel installations
-Performs ongoing maintenance system activities such as coordination and maintenance of user accounts and reference tables, maintenance of business rules, data error corrections, data validation and job monitoring activities

Computer Management Specialist
Type: New Position

Responsibilities

-Provides on site support with setup and operation of computers and printers, installation of systems software; installation, configuration, and support of department approved software; assists and supports with PSD net (internet, MS Exchange, RI-Net and any other applications that are implemented in the department); inspect and troubleshoot problems with computers and their peripherals, file servers, controllers, routers, etc.
-Continued support in the areas of memory up grading, problem diagnosis and recommended repair, etc.
-Assists and supports with application software for educational and administrative purposes.
-Responds to inquiries for solutions to problems using existing software packages as they are developed for school use. This includes training and support in these areas.
-Acts as technology consultant to the school or department organization
-Works with the technical contact persons in their assigned schools or department and act as an interface with assigned sites and Office of Technology (OT). Assists with the training of the designated technical contact person.
-Supports desktop operating systems, MAC OS, DOS, Windows.
-Supports the OT Helpdesk (once implemented) on technical issues.
-Provides updates, status and completion information to Senior Director of Technology or their designee, problem request tracking system (once implemented) and/or users.
-Reinstall defective or inadequate software packages.
-Assists school personnel with Network designs.
-Provides Network technical support to school departments.
-Trains department personnel in Network use.
-Writes and updates technical documentation that described Network functions at the user level.
-Installs and configures Network devices at the user desktop and tests for functionality with software on Department standards list.
-Keeps abreast of changing hardware and software technology.
-Provides training and support in the use of student application software (Currently REG but subject to change.
-Assists schools prepare for the opening of school each fall. This includes verifying all systems are operational and fully configured for use with all updates and such.
-Responsible for inventory and asset tracking of hardware in the schools. This includes data input of this information in the department system.
-Assists, supports and trains in the use of REG, as well as, any other department software such as MS Office, Exchange, etc.
-Assists schools with maintaining and assuring data integrity, security and consistency.
-Assists schools in implementing new or modified systems or procedures developed or purchased centrally.

Help Desk and PC Technicians
Type: Existing and New Positions

Responsibilities

-Provides the primary technical trouble shooting services
-Repairs and diagnoses computer hardware, peripheral equipment, and software in the school building throughout the department
-Retrieves lost data from hard or floppy media after accidental deletion or disk crash utilizing appropriate utilities
-Troubleshoots problems related to computer and network systems
-Utilizes a variety of electronic testing equipment
-Aligns, adjusts and calibrates equipment in accordance with specifications
-Replaces defective components and wiring

Other Contracted Services for Repair
Type: Existing and new contracted services

Responsibilities

-Works with the technology staff to provide technology support, repairs, and diagnosis of computer hardware, peripheral equipment, and software for the department and at the school building level.

Director of Instructional Technology
Type: Existing full-time position

Responsibilities

-Provides leadership and direction in the development of instructional materials and teaching aids.
-Provides Department-wide Technology Leadership and Team Building
-Plans and delivers professional development to educators and other professionals focused on integrating technology into the curriculum
-Oversees and trains staff in procedures, techniques, and methods of assigned projects
-Participates in the selection of assigned staff and conduct performance evaluation.
-Assesses needs of educator audiences, devises strategies, and creates programs of professional development that respond to identified needs
-Creates and maintains the e Department's website
-Provides guidance and support to sites in creating and maintaining web-based homepages.
-Integrates Web-based teacher development with in-person professional development.
-Advises school sites regarding hardware and software purchases
-Makes recommendations to the department's Chief Technology Officer
-Organizes training on the use of software applications, hardware and presentation technology
-Establishes a hot line for site assistance as it relates to technology curriculum integration
-Works with business/community to establish alternative funding for technology
-Provides grant writing assistance to sites
-Acts as a resource to subject area specialists and resource staff
-Works with the Personnel Department to rewrite job descriptions to reflect technology skills
-Meets regularly with key site technology persons to train, retrain and inform
-Schedules and coordinates quarterly technology fairs
-Publicizes state, county and department technology conferences and workshops
-Works with the CTO to establish a plan for maintenance, replacement, upgrading and updating equipment
-Develops opportunities to reward and provide incentives to staff who have demonstrated outstanding use of technology in the classroom
-Identifies and showcases students who display exceptional technology skills and talent
-Provides direction for classified personnel assigned to the Educational Media Centers
-Processes orders, receives state instructional materials and maintains appropriate records.
-Serves on Department committees as assigned.
-Refers teachers to video services.
-Disseminates literature and research which might contribute to the improvement of instruction.
-Maintains a professional library including periodicals.
-Assists building administrators in designing and developing school-level media facilities.
-Maintains personal professional growth pertaining to new trends, theories, and research in media and technology through active participation in selected work-related responsibilities, university classes and seminars.
-Seeks and maintains knowledge and awareness of the current scope and sequence of the curriculum and is proficient in the delivery of instruction principles and practices.
-Consults with staff on integrating electronic information resources into courses, including creating guides, tutorials, and reference lists.
-Assists staff in distance education including web-based and interactive television technologies.
-Works closely with staff to identify, evaluate, and recommend instructional resources, professional development activities, and technology software and hardware based on user-defined needs.

Technology Integration Mentors
Type: Shared positions contracted or release time. (Funded as part of Professional Development)

Responsibilities

-Focuses on the direct delivery of services to support departments in improving student achievement through technology integration.
-Models and trains staff in the effective use of instructional media materials and equipment in the classroom, professional activities, and public presentations.
-Works with administrators, teachers and staff in utilizing REG 2000 for tracking students and decision support.
-Collaborates with teachers to integrate technology into instruction
-Co-teaches to integrate technology
-Creates technology operating/training aids
-Offers short technology training workshops
-Assists with the introduction of new technology related curriculums
-Provides technology training to students
-Acts as a resource to building-level subject area specialists and resource staff
-Assists in the development of professional competencies and skills of local department instructional media personnel.
-Assists in the selection of effective curriculum and professional development resources and increase the usage and integration of the materials into the learning process.

Professional Development Providers
Type: Contracted Services (Funded as part of Professional Development)

Responsibilities

-Provides training services the staff under the direction of Technology Integration Coordinator

Monitoring and Evaluation
Type: Proposed contracted service (Funded as part of Professional Development)

Responsibilities

-Develops and implements a plan for measuring the success of the use of technology for improving student learning.
-Evaluates departments technology strengths, resources, and needs.
-Creates and implements professional development program evaluation to assess effectiveness and inform future planning

Technology Coordinators
Type: Existing stipend positions

Responsibilities

-Serves as technology liaison between the building personnel and department technology services.
-Performs as a member of a team in the routine inspection of assigned building level computer and network hardware and software installation, maintenance and diagnostics
-Takes action to remedy malfunctions.
-Provides user support and assistance in troubleshooting of local area network